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PRACTICAL EXAMPLES
IN
ARITHMETIC

BY WILLIAM H. REUCK.

PRINCIPAL OF WARD SCHOOL NO. 7, AND PROFESSOR OF MATHEMAT
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NEW YORK:
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PREFACE.

It is with much diffidence that the author presents this volume to the public, particularly when there are already many books on the same subject, written by persons of superior attainments and practical ability, sufficient to cover the whole ground of arithmetic. But within the last few years the grade of common school education has advanced so rapidly, and the theoretical parts of arithmetic are so thoroughly taught, that a book which should contain a complete treatise of theory and practice, would constitute a work almost too lumbersome for every-day use in our schools; in fact, the insufficiency of practical examples in arithmetic, has been a source of complaint for some time. The author having been connected with the Public Schools of this city since his earliest recollection, has had many facilities for collecting examples peculiarly adapted to the wants of the school, and he has long had them in manuscript, for his own particular use; on the recommendation of many teachers, they are now produced in the form of a book.

The idea has been to collect all the varieties of examples that occur in the different arithmetics, and have them so arranged as will be most easy and useful to the mass of scholars attending the schools, and the arrangement of the subjects has been approved by all the profession of the city, who have examined the manuscript, and in many cases has been suggested by them.

The remainders in division are placed in the form of a fraction, with the understanding that the number above the line is to be called the remainder, and the one below the divisor.

After division, a few fractions used as multipliers and divisors, are introduced for the purpose of preparing the way for the $\frac{1}{2}$ and $\frac{1}{4}$ used in denominate numbers, which immediately follow, and likewise, for affording as much as possible, that large class of children who leave school early, an opportunity to form some little acquaintance with fractions; denominate numbers have been placed before fractions, because it is a subject, of which a knowledge is more easily acquired, and it is more pleasing to the pupil to step from division to denominate numbers, than to fractions.

This arrangement has been objected to by some, on account of anticipating fractions; but if fractions be placed before denominate numbers there will be much more anticipated, or the subject will have to be interrupted by the interpolation of denominate numbers.

Proportion does not occupy that prominent position that it does in some works; analysis, as can easily be seen from an examination of the book, is the groundwork for solving those questions formerly done by proportion. This subject is treated of, particularly in reference to its qualities as a *proportion*.

The answers are placed with nearly all the examples, on the ground, that they might as well be there as anywhere else, for if a pupil is disposed to copy the answers in one case he will do it in another.

A book without answers is a very unsatisfactory thing to teachers and pupils.

The author takes this opportunity to express to his fellow teachers his most grateful acknowledgment for the universal kindness he has received from them, when their time and patience may have been taxed in reviewing the book, and furnishing many of the most prominent features; and whether the experiment succeed or fail, the remembrance of their kind feelings towards him will ever be a source of pride and gratification.

NEW YORK, *August*, 1854.

WM. H. REUCK.

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PRACTICAL EXAMPLES

IN

ARITHMETIC.

NOTATION AND NUMERATION.

ARTICLE 1. What is ARITHMETIC?

Arithmetic is the science of numbers; it treats, 1st, of the elementary properties of numbers,

2d. Of the operations upon numbers, called calculation.

ART. 2. What are the elementary rules of Arithmetic?

Notation and Numeration, Addition, Subtraction, Multiplication and Divison.

ART. 3. What is NOTATION?

Notation is the art of writing numbers by figures or letters.

ART. 4. What is NUMERATION?

Numeration is the art of reading numbers when written.

ART. 5. What are the two methods of Notation?

Arabic and Roman.

ART. 6. What is the distinction?

The Arabic method is written by figures and the Roman, by letters.

ART. 7. What are the elementary *figures* of all numbers?

0	named	nothing, zero or a cipher.						
1	"	one or a unit.						
2	"	two	expressing	two	ones	or	two	units.
3	"	three	"	three	"	"	three	"
4	"	four	"	four	"	"	four	"
5	"	five	"	five	"	"	five	"
6	"	six	"	six	"	"	six	"
7	"	seven	"	seven	"	"	seven	"
8	"	eight	"	eight	"	"	eight	"
9	"	nine	"	nine	"	"	nine	"

NOTE.—The first of these is called the insignificant figure, from its name, the others are called significant figures. Although 0 is called the insignificant figure, it implies nothing only when written alone; when it is placed to the right of any of the significant figures, it increases their value.

ART. 8. What are the elementary *letters* that are used to express numbers?

I (one), V (five), X (ten), L (fifty), C (one hundred), D (five hundred), and M (one thousand).

ART. 9. How are figures combined to form numbers greater than 9?

By annexing the elementary figures to each other and giving a name to them according to the position which they occupy. Thus:—

Hundreds of Trillions.	Tens of Trillions.	Trillions.	Hundreds of Billions.	Tens of Billions.	Billions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
3	4	7	2	9	8	6	5	9	0	0	8	7	6	5

ART. 10. What is the rule for reading numbers?

Separate them into periods of three figures each, commencing at the right, and give to each period a name expressive of its value according to the following table; the period to the right consists of units, tens, and hundreds, and each period to the left is sub-divided into units, tens, *and hundreds of its own name. Then begin at the left and read towards the right, giving to each period its proper name and subdivisions.*

Undecillions.	Decillions.	Nonillions.	Octillions.	Septillions.	Sextillions.	Quintillions.	Quadrillions.	Trillions.	Billions.	Millions.	Thousands.	Hundreds.
786,	530,	756,	783,	567,	806,	784,	527,	875,	611,	830,	956,	801,

NOTE.—This mode of separating numbers, is called the French method, and is generally used in the United States. The English method is to separate numbers into periods of six figures.

ART. **11.** How are *letters* combined to express numbers between those represented by single characters?

By repeating the same character, and by prefixing or annexing one of less value to one of greater.

NOTE.—When a character of less value is prefixed to one of greater, it *diminishes* the greater by an amount equal to itself; when annexed, it *increases* the greater by an amount equal to itself.

The following are some of the combinations:—

II.	(Two)	XXI.	(Twenty-one)
III.	(Three)	XXIX.	(Twenty-nine)
IV.	(Four)	XL.	(Forty)
VI.	(Six)	LX.	(Sixty)
VII.	(Seven)	XC.	(Ninety)
VIII.	(Eight)	CX.	(One hundred and ten)
IX.	(Nine)	CXIX.	(One hundred and nineteen)
XI.	(Eleven)	CCC.	(Three hundred)
XIV.	(Fourteen)	DCC.	(Seven hundred)
XVI.	(Sixteen)	MDCCC.	(Eighteen hundred.)
XIX.	(nineteen)		

ART. **12.** How many kinds of numbers are there?

Two; simple or abstract and denominate numbers.

ART. **13.** What is a simple or abstract number?

It is a number not applied to things, as simply, 2, 3, 15, *&c.*

Art. 14. What is a denominate number?

It is a number applied to things, or having the name of some standard unit, as 2 apples, 6 pounds, 9 bushels, &c.

Note—The operations performed upon simple numbers are called the simple rules;
When denominate numbers are composed of two or more denominations, they are sometimes called *compound* numbers.

SIMPLE NUMBERS—ADDITION.

Art. 15. What is Addition?

Addition is the uniting of two or more numbers of the same name or kind into one.

Art. 16. To add simple numbers,

Rule.—*Place them one under another with units under units, tens under tens, hundreds under hundreds, &c., forming columns of units, tens, hundreds, &c.; commence at the bottom of the column of units and add it upwards; if the sum be 9 or less, set it down under the column of units; if it be more than 9, set down the right hand figure under the column of units and carry the left hand figure or figures to the column of tens, and add it similarly to the column of units, place the right hand figure under the column of tens and carry the left hand figure or figures to the column of hundreds; proceed in this manner to the last column when the whole amount must be set down.*

Art. 17. To prove Addition,

Commence at the top of the column of units and add the several columns downwards.

Note.—The sign + (plus), denotes that the numbers between which it is placed are to be added.
The sign = denotes that the number or quantities between which it is placed, are equal to each other. Thus, $4+2=6$.

(1.)	(2.)	(3.)	(4.)
234	3492	2841	2321
177	1004	1876	462
432	6570	2131	1874
120	4211	1010	590
963	15277	7858	5247

(5.)	(6.)	(7.)	(8.)
1289	4691	9	459
462	921	27	59
1240	12	418	6759
32	816	64	311
475	1912	5419	109
1894	8	315	
5392	8360	6252	7697

(9.)	(10.)	(11.)
98651	591863	37585
6751	59007	5706
989	8505	908
5675	37805	718
43506	8708	617
86305	908	80956

(12.)	(13.)	(14.)
892360909	32569	2657800896
11775908	759089	95834926
892358459	6678	7316919
5736576789	98649	545837
309208555	595009	168729449
3059555	8095	500700335

(15.)	(16.)
37580061	13413756291
2109	5184265500562O
35708	2320047113577
127059	185600742356
6551275	320143298003
85375075	21208572963
4278111	5197791199

17. What is the sum of 307, 679, 4189, 7111, 816, 995, 3307, 886, and 15? Ans. 18305.

18. What is the sum of 1801, 6911, 58, 79861, 4386, 50015, 98653, 181615, 78216, and 5006? Ans. 506522.

19. What is the sum of 130560, 78100, 93775, 68722, 500610, 3011561, 729816, and 440075? Ans. 5053219.

20. What is the sum of 351672, 335790, 698375, 412793, 75211, 351692, 549006, and 17111? Ans. 2791650.

21. What is the sum of two hundred and seven, three hundred and sixty-two, nine hundred and forty-five, two thousand three hundred and forty-three, fifteen thousand six hundred and twenty-two, and forty-five thousand and eight? Ans. 64487.

22. What is the sum of eighteen thousand three hundred and twenty, seventy-four thousand five hundred and six, two hundred and seventeen thousand nine hundred and twenty-one, fifty-three thousand seven hundred and eleven, five hundred and seventy-six thousand three hundred and four, and six hundred and fifty thousand and forty-four? Ans. 1590806.

23. Add 24 thousand 306, 150 thousand 525, 77 millions 354 thousand 550, 630 millions 297 thousand 502, 5 billions 72 millions 861 thousand 563. 340 tril-

lions 750 billions 75 thousand and 2, 21 quadrillions 17 trillions 702 millions 540 thousand 442?
Ans. 21357756483303890.

24. What is the sum of 864700+3687921+86470029+3865007+653219+1000? Ans. 95541876.

25. What is the sum of 386000591+54631122+796351+84001+9000+86521+358600+8888888+100000000? Ans. 550855074.

26. What is the sum of 586321+78630+8699+3586722+893042+75699+1400+8700963+44000?
Ans. 13975476.

27. What is the sum of 18+293+4621+89366+509603+7863591+87963425? Ans. 96430917.

28. What is the sum of 87 006 292+9864321+186911+75201+6899+725+66? Ans. 97140415.

SIMPLE NUMBERS.—SUBTRACTION.

ART. 18. What is SUBTRACTION?

Subtraction is the finding of the difference between two numbers of the same name or kind.

ART. 19. What are the terms used in Subtraction?

The Minuend or greater number, the Subtrahend or less number, and the Remainder, or difference between the greater and less numbers.

ART. 20. To subtract simple numbers,

RULE.—*Place the less under the greater, with units under units, tens under tens, &c.; commence at the units and subtract each figure in the subtrahend from the one above in the minuend, and set down the difference under the figures subtracted; if any figure below, be greater than that above, add* 10 *to the upper figure and from the sum* *subtract the one below; set down the difference, add one to the next left hand figure of the subtrahend, and subtract as before.*

ART. 21. To prove Subtraction,

Add the subtrahend and remainder together; if the sum be equal to the minuend, the work is right.

NOTE.—The — (minus), denotes that the numbers between which it is placed are to be subtracted, the one having the sign before it, being the subtrahend.

	(1.)	(2.)
From	3725 Minuend.	75625
Take	2164 Subtrahend.	24319
Ans.	1561 Remainder.	51306
	(3.)	(4.)
	1376781	36704527
	695845	10625365
	680936	26079162
	(5.)	(6.)
	592700516	623115923
	81425307	451016100
	(7.)	(8.)
	78629000	593567035
	17664508	96214073
	60964492	
	(9.)	(10.)
	1370426019	7910016302
	820512055	20081506
		7889934796

(11.)
872036005
51052008

(12.)
123570000
6720005

(13.)
316900082506
51120097805

(14.)
46299902756
589904756

(15.)
986150083555
96140076559

(16.)
73006542182
63008400153

17. From 758901 subtract 349806. Ans. 409095.
18. From 329500 take 54650. Ans. 274850.
19. From 720065991 take 12095899. Ans. 707970092.
20. Subtract 390 from 10 000. Ans. 9610.
21. Subtract 188605 from 189501. Ans. 896.

22. What is the difference between 2300562 and 199811? Ans. 2100751.

23. What is the difference between 9859670800 and 10906459860500? Ans. 10896600189700.

24. If the sum of two numbers be 95000 and one of them be 8006, what will the other be? Ans. 86994.

25. If the sum of two numbers be 86957111, and one of them be 49963415, what will the other be? Ans. 36993696.

26. If the greater of two numbers be 300011, and the less 290021, what is the difference? Ans. 9990.

27. There are two numbers, the greater is 40690080, and the less is 699090, what is the difference? Ans. 39990990.

[illegible] The difference between two numbers is [illegible]985, and the greater is [illegible]00000; what is the less number? Ans. [illegible]

[illegible] What is the difference between the sum of [illegible], [illegible], and [illegible], and the sum of [illegible], [illegible], and [illegible]? Ans. [illegible]

[illegible] What is the difference between the sum of [illegible], [illegible], [illegible], and [illegible], and the sum of [illegible], [illegible], [illegible], and [illegible]? Ans. [illegible]

31. If a person have $[illegible] and lose $[illegible]10, how much will he have left? Ans. $[illegible]

Note.—$ is the sign for dollars.

32. If a merchant enter in business with a capital of $[illegible], and at the end of one year have $[illegible]105, how much will he have made? Ans. $[illegible]

33. Suppose three persons commence business, the first putting in $[illegible], the second $[illegible]700, and the third $[illegible]50; if at the end of one year they have together $140[illegible]1, how much will they have gained? Ans. $[illegible]

SIMPLE NUMBERS.—MULTIPLICATION.

Art. 22. What is **Multiplication**?

Multiplication is the repetition of a number or quantity.

Art. 23. What are the terms used in Multiplication?

They are the Multiplicand, the Multiplier, and the Product.

Art. 24. What is the Multiplicand?

The Multiplicand is the number to be repeated or multiplied.

Art. 25. What is the Multiplier?

The Multiplier is the number of times that the multiplicand is to be repeated.

Art. 26. What is the Product?

The Product is the result of the repetition.

Art. 27. What are the Multiplicand and Multiplier taken together called?

Factors.

Art. 28. What is a Composite number?

A Composite number is one that is composed of two or more factors.

Art. 29. To multiply simple numbers,

Rule.—*Place the multiplier under the multiplicand, units under units, tens under tens, &c.*

I. *If the multiplier be 12 or less, multiply the units of the multiplicand by the multiplier; set down the units of the product under the units of the multiplier, and carry the remaining figure or figures to the product of the tens of the multiplicand by the multiplier; place the right hand figure of this result under the tens of the multiplier or multiplicand, and carry the remaining figures to the product of the hundreds of the multiplicand by the multiplier; proceed in like manner to the last figure of the multiplicand, when the entire result must be set down.*

II. *If the multiplier be greater than 12, multiply the multiplicand by each figure of the multiplier separately, commencing with units, and set the products under each other, observing to place the right hand figure of each product under that figure which is used as a multiplier; add the several products together, and their sum will be the entire product.*

Art. 30. To prove Multiplication,

Rule.—*Make the Multiplier the Multiplicand, or add the figures that compose the multiplicand, and when the*

PRACTICAL EXAMPLES

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Numeration is the art of reading numbers when written.

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Arabic and Roman.

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The Arabic method is written by figures and the Roman, by letters.

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0	named	nothing, zero or a cipher.						
1	"	one or a unit.						
2	"	two	expressing	two	ones	or	two	units.
3	"	three	"	three	"	"	three	"
4	"	four	"	four	"	"	four	"
5	"	five	"	five	"	"	five	"
6	"	six	"	six	"	"	six	"
7	"	seven	"	seven	"	"	seven	"
8	"	eight	"	eight	"	"	eight	"
9	"	nine	"	nine	"	"	nine	"

Note.—The first of these is called the insignificant figure, from its name, the others are called significant figures. Although 0 is called the insignificant figure, it implies nothing only when written alone; when it is placed to the right of any of the significant figures, it increases their value.

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By annexing the elementary figures to each other and giving a name to them according to the position which they occupy. Thus:—

Hundreds of Trillions.	Tens of Trillions.	Trillions.	Hundreds of Billions.	Tens of Billions.	Billions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
3	4	7	2	9	8	6	5	9	0	0	8	7	6	5

Art. 10. What is the rule for reading numbers?

Separate them into periods of three figures each, commencing at the right, and give to each period a name expressive of its value according to the following table; the period to the right consists of units, tens, and hundreds, and each period to the left is sub-divided into units, tens, *and hundreds of its own name. Then begin at the left and read towards the right, giving to each period its proper name and subdivisions.*

Undecillions.	Decillions.	Nonillions.	Octillions.	Septillions.	Sextillions.	Quintillions.	Quadrillions.	Trillions.	Billions.	Millions.	Thousands.	Hundreds.
786,	530,	756,	783,	567,	806,	784,	527,	875,	611,	830,	956,	801,

NOTE.—This mode of separating numbers, is called the French method, and is generally used in the United States. The English method is to separate numbers into periods of six figures.

ART. **11.** How are *letters* combined to express numbers between those represented by single characters?

By repeating the same character, and by prefixing or annexing one of less value to one of greater.

NOTE.—When a character of less value is prefixed to one of greater, it *diminishes* the greater by an amount equal to itself; when annexed, it *increases* the greater by an amount equal to itself.

The following are some of the combinations:—

II.	(Two)	XXI.	(Twenty-one)
III.	(Three)	XXIX.	(Twenty-nine)
IV.	(Four)	XL.	(Forty)
VI.	(Six)	LX.	(Sixty)
VII.	(Seven)	XC.	(Ninety)
VIII.	(Eight)	CX.	(One hundred and ten)
IX.	(Nine)	CXIX.	(One hundred and nineteen)
XI.	(Eleven)	CCC.	(Three hundred)
XIV.	(Fourteen)	DCC.	(Seven hundred)
XVI.	(Sixteen)	MDCCC.	(Eighteen hundred.)
XIX.	(nineteen)		

ART. **12.** How many kinds of numbers are there?

Two; simple or abstract and denominate numbers.

ART. **13.** What is a simple or abstract number?

It is a number not applied to things, as simply, 2, 3, 15, *&c.*

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67. What are three factors of 360?
Ans. 12, 3, and 10, or 6, 5, and 12, &c.
68. What are three factors of 462?
Ans. 6, 7, and 11.
69. What are three factors of 1560?
Ans. 10, 12, and 13.
70. What are the prime factors of 18?
Ans. 2, 3, 3.
71. What are the prime factors of 36?
Ans. 2, 2, 3, 3.
72. What are the prime factors of 128?
Ans. 2, 2, 2, 2, 2, 2, and 2.

ART. 50. To divide by a composite number,

RULE.—*Divide the given dividend by one factor of the divisor, and then divide the quotient thus obtained by another factor, and so proceed until all the factors have been used as divisors.*

ART. 51. To find the complete remainder,

RULE.—*Multiply the second remainder by the first divisor, and add in the first remainder; the result will be the complete remainder for the first two divisions; if there be a third divisor, multiply the remainder by the product of the two previous divisors and add in the complete remainder arising from the first two divisions; the result will be the complete remainder for three divisions; if there be a fourth, or succeeding divisors, proceed in a like manner.*

73. Divide 17496 by 36, separated into two factors.
Ans. 486.
74. Divide 98710 by 84, separated into two factors.
Ans. $1175\frac{10}{84}$.
75. Divide 66921 by 88, separated into two factors.
Ans. $760\frac{41}{88}$.
76. Divide 54833 by 108, separated into two factors.
Ans. $507\frac{71}{108}$

77. Divide 127563 by 156, separated into two factors.
Ans. $817\frac{111}{156}$.

78. Divide 946729 by 180, separated into two factors
Ans. $5259\frac{109}{180}$.

79 Divide 598436 by 169, separated into two factors.
Ans. $3541\frac{7}{169}$.

80 Divide 190000 by 225, separated into two factors.
Ans. $844\frac{100}{225}$.

81. Divide 16781200 by 1728, separated into three factors. Ans. $9711\frac{592}{1728}$.

82. Divide 7286511 by 729, separated into three factors. Ans. $9995\frac{156}{729}$.

83. Divide 15867295[illegible] by 1296, separated into three factors. Ans. $122432\frac{1079}{1296}$.

84. Divide 5987726 by 576, separated into four factors. Ans. $10395\frac{206}{576}$.

Art. 52. To abbreviate division when the divisor and dividend have one or more common factors,

Rule.—*Omit the common factor or factors, and then divide the product of the remaining factors of the dividend by that of the divisor.*

Note —This omission of common factors is called Cancellation.

86. Divide 6×7×9 by 3×7. Ans. 18.
87. Divide 4×8×15 by 2×3×5. Ans. 16.
88. Divide 8×9×12×16 by 8×9×24. Ans. 8.
89. Divide 3×5×16×27 by 3×10×12. Ans. 18.
90. Divide 7×9×15×50 by 5×7×6. Ans. 225.
91. Divide 2×18×55×100 by 3×11×20. Ans. 300.
92. Divide 40×50×500 by 4×10×100. Ans. 250.
93. Divide 1296 by 48. Ans. 27.
94. Divide 16380 by 1260. Ans. 13.
95. Divide 367400 by 2200. Ans. 167.
96. Divide 26×73×115 by 5×26. Ans. 1679.

97. Divide $708 \times 1000 \times 4500$ by $36 \times 50 \times 75$. Ans. 23600

98. What is the quotient of $108 \div 9$? Ans. 12.

99. What is the quotient of $2016 \div 36$? Ans. 56.

100. What is the quotient of $4194 \div 54$? Ans. $77\frac{36}{54}$.

101. What is the quotient of $718677 \div 87$? Ans. $8260\frac{57}{87}$.

102. What is the quotient of $1890018 \div 408$? Ans. $4632\frac{162}{408}$.

103. What is the quotient of $7 \times 12 \div 6 \times 7$? Ans. 2.

104. What is the quotient of $5 \times 6 \times 100 \div 4 \times 6 \times 25$? Ans. 5.

105. What is the quotient of $200 \times 225 \times 460 \div 20 \times 23 \times 25$? Ans. 1800.

106. What is the quotient of $69 \times 450 \times 7000 \div 3 \times 14 \times 15 \times 50$? Ans. 6900.

107. What is the quotient of $\frac{1600}{50}$? Ans. 32.

108. What is the quotient of $\frac{14750}{250}$? Ans. 59.

109. What is the quotient of $\frac{38673}{90}$? Ans. $429\frac{63}{90}$.

110. What is the quotient of $\frac{18099}{63}$? Ans. $287\frac{18}{63}$.

111. What is the quotient of $\frac{7 \times 8 \times 11}{2 \times 22}$? Ans. 14.

112. What is the quotient of $\frac{15 \times 96 \times 550}{5 \times 12 \times 55}$? Ans. 240

113. What is the quotient of $\frac{11 \times 18}{3 \times 11}$? Ans. 6

114. What is the quotient of $\frac{179866}{299}$? Ans. $601\frac{167}{299}$

115. What is the result of $\frac{36}{18} \times 15$? Ans. 30.

116. What is the result of $\frac{90}{5} \times 10$? Ans. 180.

117. What is the result of $\frac{75}{15} \times 12$? Ans. 60.

118. What is the result of $\frac{250}{50} \times 25$? Ans. 125.

119. What is the result of $\frac{630}{21} \times \frac{24}{8}$? Ans. 90.

120. What is the result of $\frac{4840}{22} \times \frac{725}{25}$?
Ans. 6380.

121. What is the result of $\frac{8649}{18} \times 36$?
Ans. 17298.

Art 53. When the number of articles and their value are known. how can the value of a single article be found ?

Rule —*Divide the value of all the articles by the number of articles ; the quotient will be the value of a single article.*

Art. 54. When the value of a single article and the value of several articles are known, how can the number of articles be found ?

Rule.—*Divide the value of all the articles by the value of a single article ; the quotient will be the number of articles.*

Note.—The divisor and dividend should always be of the same name, except when the value of a single article is to be found.

122. If 25 bushels of wheat cost $50, what will one bushel cost ? Ans. $2.
123. If 64 barrels of wheat cost $448, what will one barrel cost ? Ans. $7.
124. If 75 hogsheads of sugar cost $1200, what will one hogshead cost ? Ans. $16.
125. If 725 acres of land cost $49300, what will one acre cost ? Ans. $68.
126. If 950 suits of clothes cost $35150, what will one suit cost ? Ans. 37.
127. If one barrel of pork cost $13, how many barrels can be bought of $12285 ? Ans. 945 barrels.
128. If $3550 will buy one house, how many houses of the same value each, will $102950 buy ?
Ans. 29 houses.

129. If a person can walk 29 miles a-day, how many days will it take him to travel 22098 miles?
Ans. 762 days.

130. If a person can count 6800 in an hour, how many hours will it take him to count 31769600?
Ans. 4672 hours.

131. If it cost $30000000 to construct a railroad 384 miles long, what will be the average cost a mile?
Ans. $78125.

PROMISCUOUS EXAMPLES.

NOTE.—In the following sums, it is a very useful and interesting exercise to indicate the operations to be performed.

1. If 9 pounds of sugar cost 63 cts., what will 1 pound cost? What will 14 pounds cost? Ans. 98 cents.

2. If 12 yards of cloth cost $72, what will one yard cost? What will 56 yards cost? Ans. $336.

3. If 13 yards of velvet cost $65, what will 19 yards cost? Ans. $95.

4. If 29 bushels cost 754 pence, what will 35 bushels cost? Ans. 910 pence.

5. If 213 yards of cloth cost $852, what will 254 yards cost? Ans. $1016.

6. If 211 pounds of tea cost 17724 cents, what will 628 pounds cost? Ans. 52752 cents.

7. If you can buy 765 yards of muslin for $51, how many yards can you get for $376? Ans. 5640 yards.

8. If you buy 3420 oranges for $76, how many can you buy for $37? Ans. 1665 oranges.

9. If you can buy 87724 bricks for $964, how many can you buy for $429? Ans. 39039 bricks.

10. If 75 yards of cloth cost $375, how many yards can be bought for $1865? Ans. 373 yards.

11. If 38 acres of land cost $11172, how many acres can be bought for $107310? Ans. 365 acres.

12. If 437 acres cost $271377, how many acres can be bought for $581256? Ans. 936 acres.

13. What will 1659 sheep cost at the rate of 624 shillings for 13 sheep? Ans. 79632 shillings.

14. If 1000 feet of lumber cost 6000 cents, how many feet can be bought for 161400 cents?

Ans. 26900 feet.

15. If 100 pounds of pork cost 1400 cents, what will 1786 pounds cost? Ans. 25004 cents.

16. A person had five houses: he sold one for $3820, another for $6364, the third for $4840, the fourth for $5600, and the fifth for $7260; he divided the amount equally between his 4 children, how much did each one receive? Ans. $6971.

17. A person in business gained $4250 a year for 5 years: he then lost $984 a year for 4 years, and the following year he gained $4866, how much was his average gain a year? Ans. $2218 gain.

18. If a person buys 7381 pounds of sugar at 8 cents a pound, how many pounds of coffee at 11 cents a pound can he receive in exchange for the sugar?

Ans. 5368 pounds.

19. If 600 barrels of flour at 7 dollars a barrel, cost $4200, how much will 3861 barrels cost?

Ans. $27027.

20. A merchant had a capital of $30000; during the first year that he was in business, he gained $4000, in the second $5000, the third year he lost $1400, when he retired from business, and purchased property, by the sale of which he doubled his money; he then kept $50000 for himself, and divided the rest equally between his 3 sons; how much did each receive? Ans. $8400.

21. A person bought 3 hogsheads of sugar, each weighing 1240 pounds, for which he paid 9 cents a pound, how much did the whole cost?

Ans. 33480 cents.

22. A person sold 4 pieces of cloth, which measured as follows: the first two pieces contained 45 yards each, the third piece contained 47 yards, and the fourth,

53 yards; the whole cost $760; how much would that be for 50 yards? Ans. $200.

23. If 350 acres of land worth $275 an acre, and 490 acres worth $300 an acre, be exchanged for 70 houses, what will be the price of each house, supposing them to be of equal value? Ans. $3475.

SUPPLEMENT

Art. 55. If any number be divided by 2,

It will be separated into two equal parts, each of which is called $\frac{1}{2}$ *(one half) of the number, and the two parts* $\frac{2}{2}$ *(two halves,) or the number itself.*

Art. 56. If any number be divided by 3,

It will be separated into three equal parts, one of which is called $\frac{1}{3}$ *(one-third) of the number, two,* $\frac{2}{3}$ *(two-thirds) and three,* $\frac{3}{3}$ *(three-thirds) or the number itself.*

Art. 57. If any number be divided by 4,

It will be separated into four equal parts, one of which is called $\frac{1}{4}$ *(one-quarter) of the number, two,* $\frac{2}{4}$ *or* $\frac{1}{2}$ *(two-quarters or one-half) three,* $\frac{3}{4}$ *(three-quarters) and four,* $\frac{4}{4}$ *(four-fourths) or the number itself.*

Note.—These forms, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c., are called fractions, or broken numbers, and may be extended to fifths. sixths, &c. The number above the line is called the numerator, and the one below, the denominator.

Art. 58. To multiply a number by a fraction.

Rule.—*Divide the given number by the denominator, and multiply the quotient by the numerator.*

Art. 59. To multiply one number by another having a fraction attached to it.

Rule.—*Multiply by the fraction first, and to the result add the product of the two whole numbers.*

1. Multiply 186 by $\frac{1}{2}$. Ans. 93.
2. Multiply 186 by $\frac{1}{3}$. Ans. 62.
3. Multiply 986 by $\frac{1}{2}$. Ans. 493.
4. Multiply 1464 by $\frac{1}{4}$. Ans. 366.
5. Multiply 1311 by $\frac{2}{3}$. Ans. 874.
6. Multiply 1687 by $\frac{1}{2}$. Ans. $843\frac{1}{2}$.
7. Multiply 12956 by $\frac{3}{4}$. Ans. 9717.
8. Multiply 682 by $3\frac{1}{2}$. Ans. 2387.
9. Multiply 1496 by $5\frac{1}{2}$. Ans. 8228.
10. Multiply 3856 by $6\frac{1}{4}$. Ans. 24100.
11. Multiply 9259 by $30\frac{1}{4}$. Ans. $280084\frac{3}{4}$.
12. Multiply 14591 by $69\frac{1}{2}$. Ans. $1014074\frac{1}{2}$.
13. Multiply 1825 by $365\frac{1}{4}$. Ans. $666581\frac{1}{4}$.
14. Multiply 18879 by $287\frac{2}{3}$. Ans. 5430859.
15. Multiply 7864 by $68\frac{3}{4}$. Ans. 540650.
16. Multiply 5897 by $81\frac{3}{4}$. Ans. $482079\frac{3}{4}$.
17. What cost 76 bushels of oats at $37\frac{1}{2}$ cents a bushel? Ans. 2850 cents.
18. What cost 984 yards of cloth at \$$3\frac{1}{4}$ a yard? Ans. \$3198.
19. What is the value of 729 acres of land at \$$53\frac{1}{4}$ an acre? Ans. \$$38819\frac{1}{4}$.
20. If one pound of butter cost $31\frac{1}{4}$ cents, what will 988 pounds cost? Ans. 30875 cents.
21. If one pound of tea cost $62\frac{1}{2}$ cents, what will 4 boxes that contain $62\frac{1}{2}$ pounds each, cost? Ans. 15625 cents.
22. If $272\frac{1}{4}$ square feet make one square pole, how many square feet will make 398 square poles? Ans. $108355\frac{1}{2}$ square feet.
23. If $365\frac{1}{4}$ days make one year, how many days from the year 1788 to 1854? Ans. $24106\frac{1}{2}$ days.
24. What will 1497 yards of silk cost at $68\frac{3}{4}$ cents a yard? Ans. $102918\frac{3}{4}$ cents.

Art. 60. To divide a number by a fraction,

Rule.—*Multiply the given number by the denominator and divide the product by the numerator.*

Art. 61. To divide one number by another number having a fraction annexed to it,

Rule.—*Arrange the numbers for division; multiply both the divisor and the dividend by the denominator of the fraction, observing in the divisor to add in the numerator, divide the numbers thus formed, and the quotient will be the answer; if there be a remainder it will be halves if the divisor was multiplied by 2, thirds if the divisor was multiplied by 3, fourths or quarters, if by 4, &c.*

25. Divide 325 by $2\frac{1}{2}$. Ans. 130.
26. Divide 627 by $5\frac{1}{2}$. Ans. 114.
27. Divide 750 by $6\frac{1}{4}$. Ans. 120
28. Divide 1311 by $12\frac{1}{2}$. Ans. 104 rem. 11.
29. Divide 725 by $3\frac{1}{3}$. Ans. 217 rem. $1\frac{2}{3}$.
30. Divide 6211 by $8\frac{1}{3}$. Ans. 745 rem. $2\frac{2}{3}$.
31. Divide 1900 by $16\frac{2}{3}$. Ans. 114.
32. Divide 3556 by $30\frac{3}{4}$. Ans. 115 rem. $19\frac{3}{4}$.
33. Divide 7926 by $272\frac{1}{4}$. Ans. 29 rem. $30\frac{3}{4}$.
34. Divide 18464 by $69\frac{1}{2}$. Ans. 265 rem. $46\frac{1}{2}$.
35. Divide 7598 by $87\frac{3}{4}$. Ans. 86 rem. $51\frac{1}{2}$.
36. Divide 34788 by $33\frac{1}{3}$. Ans. 1043 rem. $21\frac{1}{3}$.

37. If $5\frac{1}{2}$ bushels of corn cost 253 cents, what will one bushel cost? Ans. 46 cents.

38. If $6\frac{1}{4}$ bushels of wheat cost 1025 cents, what will one bushel cost? Ans. 164 cents.

39. If $16\frac{1}{4}$ yards of cloth cost 5330 cents, what will one yard cost? Ans. 328 cents.

40. If $56\frac{3}{4}$ pounds of tea cost 2951 cents, what will one pound cost? Ans. 52 cents.

41. If $69\frac{1}{2}$ barrels of flour cost 69500 cents, what will one barrel cost? Ans. 1000 cents.

42. If you can buy $10\frac{1}{2}$ yards of muslin for one dollar for how many dollars could you buy 2394 yards? Ans. $228.

43. If one yard of silk cost $87\frac{1}{2}$ cents, how many yards may be bought for 8575 cents? Ans. 98 yards.

44. If one pound of tea cost 33⅔ cents, how many pounds may be bought for 21715 cents?

Ans. 645 pounds.

45. If one dollar will buy 13¾ pounds of sugar, how many dollars will buy 1375 pounds? Ans. $100.

FEDERAL MONEY.

Art. 62. What is **Federal Money**?

Federal Money is the currency or money of the United States, and consists of Eagles, Dollars, Dimes, Cents, and Mills.

10 Mills (*m.*)	Make	1 Cent,	Marked	*ct.*
10 Cents	"	1 Dime,	"	*d.*
10 Dimes or 100 cents	"	1 Dollar,	"	$.
10 Dollars	"	1 Eagle,	"	*E.*

Art. 63. What is Reduction of Federal Money?

It is the changing of Federal Money from one denomination to another without altering the value.

Art. 64. To reduce dollars to cents,

Rule.—*Multiply the dollars by* 100, *and if there be cents, add them in.*

Note.—In writing dollars and cents, if the cents consist of one figure, prefix a cipher to the cents, and if there are dollars and cents, or dollars, cents and mills expressed in the same number, prefix the sign of dollars to the whole amount, and after the dollars place a point; the first figure to the right of the point will be dimes, the second, cents, and the third, mills, the first two figures to the right of the point, taken together will be cents, and the three taken together will be mills.

Art. 65. To reduce cents to dollars,

Rule.—*Divide the cents by* 100; *the quotient will be dollars and the remainder cents; the result must be written as the previous note directs.*

NOTE.—If the given number be mills, cut off three figures to the right by means of a point, and prefix to the whole the sign for dollars. If the given number be dollars and cents, the whole will be reduced to cents by omitting the point, and if there be dollars, cents, and mills, omit the point and the whole will be reduced to mills.

1. Reduce $7 to cents. Ans. 700 cents.
2. Reduce $18 to cents. Ans. 1800 cents.
3. Reduce $6.25 to cents. Ans. 625 cents.
4. Reduce $54.645 to mills. Ans. 54645 mills.
5. Reduce $35.05 to cents. Ans. 3505. cents.
6. Reduce $17.09 to mills. Ans. 17090 m.
7. Reduce $53.405 to mills. Ans. 53405 m.
8. Reduce 47 cents to mills. Ans. 470 m.
9. Reduce $95.007 to mills. Ans. 95007 m.
10. Reduce 496 cents to dollars. Ans. $4.96.
11. Reduce 584 cents to dollars. Ans. $5.84.
12. Reduce 1609 cents to dollars. Ans. $16.09.
13. Reduce 14327 mills to dollars. Ans. $14.327.
14. Reduce 150 cents to dollars. Ans. $1.50.
15. Reduce 520 mills to cents. Ans. 52 cts.
16. Reduce 98006 mills to dollars. Ans. $98.006.

ADDITION.

ART. 65. To add Federal Money,

RULE.—*Place dollars under dollars, cents under cents, &c., add as in simple numbers, and place a point in the amount under the points in the sum.*

1. What is the sum of $6.50, $8.96, $5.12, $17.63, $91.40, and $16? Ans. $145.61.

2. What is the sum of $75.19, $63.54, $3.06, $9.25, $65.37, $416.12, $375, $600, and $5? Ans. $1612.53.

3. What is the sum of $861.55, $378.25, $461.37 $683.57, $728.39, $460.08, and $17? Ans. $3590.21.

4. What is the sum of $18.50, $3780, $658.06, $358.653, $818,047, $67.375, and $486.395 ?
Ans. $6187.03.

5. What is the sum of $398.007, $5.65, $885.307, $43.936, $729.063, $335.72, $8316.472, $3768.082 and 56 cents ? Ans. $14482.797.

6. What is the sum of $3000, $1616.05, 375 mills, $387.50, $3456.087, $4900.008, and $2500.
Ans. $15860.02.

7. A person bought a house for $5000, a store for $6290, merchandise for $23654.12, a horse and wagon for $278.53, a farm for $9371.60, rail-road stock for $11500, and a watch for $92.725; what did the whole amount to ? Ans. $56186.975.

SUBTRACTION.

Art. 66. To subtract Federal Money,

Rule.—*Place the less quantity under the greater, with dollars under dollars, cents under cents, &c.; subtract as in simple subtraction, and place a point in the remainder under the points of the minuend and subtrahend.*

1. From $75.67 take $47.35. Ans. $28.32.
2. From $378.91 take $257.66. Ans. $121.25.
3. From $835.06 take $286.09. Ans. $548.97.
4. From $1865.72 take $394.88. Ans. 1470.84.
5. From $6958.375 take $1400.75.
Ans. $5557.625.
6. From $18397 take $9508.44. Ans. $8888.56.
7. From $23467.06 take $15729.489.
Ans. $7737.571.

8. From the sum of $981.43 and $456.81, take $498.75. Ans. $939.49.

9. From $10,000 take the sum of $4367.18 and $3587.47. Ans $2045.35.

10. From the sum of $965 and $341.60, take the sum of $433.33 and $89.47. Ans. $783.80.

11 A person at various times received $27.40, $68.75. $810.47, $386.59, $2.20; he also paid the following amounts: $78.67, $129.72, $119.46, and $3.88; how much did he have left? Ans. $963.68.

12. A person had $50000; he bought a horse and wagon for $550, which he sold for $625; he then bought a house for $3750, and built a store which cost $7875, and bought groceries to the amount of $1895.63; how much did he then have left? Ans. $36554.37.

MULTIPLICATION.

Art. 67. To multiply Federal Money,

Rule.—*Multiply the given amount of Federal Money by the multiplier, as in simple multiplication;—the product will be of the same name as the given amount of Federal Money.*

1. Multiply $586 by 13. Ans. $7618.
2. Multiply $28.50 by 15. Ans. $427.50.
3. Multiply $381.45 by 24. Ans. $9154.80.
4. Multiply $299.66 by 39. Ans. $11686.74.
5. Multiply $75.867 by 73. Ans. $5538.291.
6. Multiply $492.25 by 160. Ans. $78760.
7. Multiply $4971.80 by 28. Ans. $139210.40.
8. Multiply $659.375 by 32. Ans. $21100.
9. Multiply $1875.125 by 54. Ans. $101256.75.

When the value of a single article is known, how can the value of any number of articles of the same kind be found? (Art. 34.)

10. If one barrel of flour cost $6.75, what will 29 barrels cost? Ans. $195.75.

11. If one barrel of pork cost $13.88, what will 100 barrels cost? Ans. $1388.

12. If one barrel of beef cost $15.75. what will 139 barrels cost? Ans. $2189.25.

13. If one hogshead of wine cost $287.40, what will 17 hogsheads cost? Ans. $4885.80.

14. If one cord of wood be worth $9.625, what will 278 cords be worth? Ans. $2675.75.

15. If one acre of land cost $488.69, what will 625 acres cost? Ans. $305431.25.

16. If it cost the United States $109688.15 a day, for the expenses of government, how much will it amount to in 365 days? Ans. $40036174.75.

17. A person bought 561 pounds of cheese at 15 cents a pound, and 398 pounds of coffee at 17 cents a pound; how much was the whole? Ans. $151.81.

18. A flour merchant sold 291 barrels of flour at $7.20 a barrel, 2961 bushels of corn at 54 cents a bushel, and 398 bushels of rye at 78 cents a bushel; how much did the whole cost? Ans. $4004.58.

19. A merchant had $21000; he bought 500 yards of cloth at $3.75 a yard, 354 yards of silk at $1.125 a yard, and 37 pieces of linen, each piece 16 yards, at 94 cents a yard; how much money had he left?

Ans. $18170.27.

20. A bought 48 tons of iron, at $64.28 a ton, and 39 tons of copper, at $193.50 a ton; B bought 633 barrels of flour, at $6.60 a barrel, and 1000 bushels of oats, at 73 cents a bushel; how much more money did A spend than B? Ans. $5724.14.

(21.)

New York, *Aug.* 1, 1850.

JOHN JONES

Bought of AVERY WHITE,

31	Dozen Buttons - - -	at	25	cents	a dozen.
49	“ - Pairs of Gloves	“	78	“	a dozen pairs.
133	Spools of Cotton - -	“	7	“	a spool.
389	Papers of Needles - -	“	8	“	a paper.
198	Pairs of Combs - -	“	16	“	a pair.
627	Papers of Pins - -	“	14	“	a paper.

What is the total? $205.86.

(22.)

New York, July 3d 1853.

TIMOTHY JENNINGS

Bought of EDWARD DURAND,

461	Yards	of Cloth - -	at	$4.25	a yard.
329	"	" Silk - - -	"	1.17	" "
643	"	" Satin - - -	"	2.25	" "
248	"	" Cassimere -	"	2.375	" "
397	"	" De Laine -	"	1.475	" "

What is the total? **$4965.505.**

(23.)

Find the amount of the following bills:

Sold CHARLES RICHARDS,

10	Yards	Striped Cassimere	at	$2
5	"	Fancy " -	"	1.50
5	"	Blue " -	"	2.25

Ans. $38.75.

(24.)

Sold JOHN W. HEARD,

12	Yards	Blue Broadcloth -	at	$3.50
3	Pieces	110 yds. Sheeting	"	20 *cts.*
9	Yards	Black Broadcloth -	"	4.50
50	"	Black Prints - -	"	31 *cts.*

Ans. $164.00

(25.)

Sold CHARLES SMITH,

10	Pieces	64	yds.	Bleached Shirtings	at	20 *cts.*
15	"	62	"	" Sheetings	"	26 "
16	"	66	"	Kentucky Jeans -	"	$1.15

Ans. $1584.20

(26.)

Sold James C. Hunt,

5½	Yards	Black Broadcloth	at $6
84	"	Duck - - - - -	" 18½
48	"	Blue Prints - - - - -	" 25
10	Dozen	Coat Buttons - - - -	" 52
68	Yards	Fancy Cassimere - - -	" $1.50
100	"	Blue " - - -	" 2.12½
64	"	Black Prints - - -	" 31¼

Ans. $400.24.

DIVISION.

Art. 68. To divide Federal Money,

Rule.—*Divide the given amount in Federal Money by the divisor, as in simple divison.*

When the number of articles and their value are known, how can the value of a single article be found? (Art. 53.)

When the value of a single article and the value of several articles are known, how can the number of articles be found? (Aet. 54.)

Note.—In this case the divisor and dividend must be of the same name; that is, if the divisor or dividend be cents, the other must be brought to cents likewise; or if either be mills, the other must be brought to mills.

1. Divide $1728.42 by 6. Ans. $288.07.
2. Divide $18672.96 by 24. Ans. $778.04.
3. Divide $1432.64 by 37. Ans. $38.72.
4. Divide $2099.334 by 219. Ans. $9.586.
5. Divide $28221.036 by 372. Ans. $75.863.
6. Divide $639.88 equally between 17 men. Ans. $37.64 per man.
7. If one hundred acres of land cost $3759.60, what will one acre cost? Ans. $37.596.
8. If 390 yards of silk cost $487.50, what will one yard cost? Ans. $1.25.

9. If 275 acres of land cost $87752.50, what will one acre cost? Ans. 319.10.

10. If a person earn $6314.50 in 365 days, how much can he earn in one day? Ans. $17.30.

11. If 346 barrels of flour cost $1825.150, what will one barrel cost? Ans. $5.275.

NOTE.—In finding the value of a single article, if the dividend consist of dollars only and there should be a remainder, annex two ciphers to the dividend, and continue the division to two more figures in the quotient, which two figures will be cents; if there be a remainder then, annex one more cipher to the dividend and continue the division to one more figure in the quotient, which will be mills.

12. If 125 barrels of flour cost $650, what will one barrel cost? Ans. $5.20.

13. If 32 gallons of wine cost $68, what will one gallon cost? Ans. $2.125.

14. If 96 yards of cloth cost $552, what will one yard cost? Ans. $5.75.

15. If 375 yards of cloth cost $2154, what will one yard cost? Ans. $5.744.

16. If 224 cords of wood cost $3934.56, what will one cord cost? Ans. 17.565.

17. If 320 bushels of oats cost $264, what will one bushel cost? Ans. 825 mills.

18. If 576 pounds of tea cost $432, what will one pound cost? Ans. 75 cents.

19. If 700 gallons of oil cost $567, what will one gallon cost? Ans. 81 cents.

20. At 6 cents a piece, how many pine-apples can be bought for 72 cents? Ans. 12.

21. How many acres of land can be bought for $87725 at $275 an acre? Ans. 319.

22. At $5.27 per barrel, how many barrels of flour can be bought for $50065? Ans. 9500 barrels.

23. If a barrel of apples cost $2.50, how many barrels can be bought for $175? Ans. 70.

24. If a yard of satin cost $3.50, how many yards can be bought for $315? Ans. 90 yards.

25. At 875 mills a bushel, how many bushels of rye can be bought for $148.75? Ans. 170. bushels.

26. If one pound of tea cost 54 cents, how many pounds may be bought for $135? Ans. 250 pounds.

PROMISCUOUS EXAMPLES.

1. If 16 horses cost $2560, what will 1 horse cost at the same rate? What will 7 horses cost? Ans. $1120.

2. If 212 pounds of tea cost $161.12, what will 1 pound cost? What will 13 pounds cost? Ans. $9.88.

3. If 56 acres of land cost $16657.20, what will 35 acres cost? Ans. $10410.75.

4. If 311 bushels of wheat cost $855.25, what will 160 bushels cost? Ans. $440.

5. If 429 bushels of wheat cost $347.49, what will 2000 bushels cost? Ans. $1620.

6. If 19 lots cost $18738.75, what will 38 lots cost? Ans. $37477.50.

7. If 196 pounds of butter cost $49, what will 2500 pounds cost? Ans. $625.

8. If 2000 yards of muslin cost $1180, what will 1629 yards cost? Ans. $961.11.

9. If 29 yards of cloth cost $101.50, how many yards can you buy for $122.50? Ans. 35 yards.

10. If 150 yards of cloth cost $751.50, how many yards can be bought for $125.25? Ans. 25 yards.

11. If a person can earn $1181.25 in 225 days, how many days would it take him to earn $1764? Ans. 336 days.

12. If 36 hogsheads of sugar cost $6315.12, how many hogsheads can be bought for $21927.50? Ans. 125 hogsheads.

13. If 23 tons of iron cost $1730.75, how many tons may be bought for $9632? Ans. 128 tons.

14. If 108 equal lots of ground cost $5711.04, how many would $1322 buy? Ans. 25 lots.

15. If 325 acres of land cost $17712.50, how many acres can be bought for $545? Ans. 10 acres.

16. If 3160 barrels of pork cost $48082, how many barrels can be bought for $1170.40?

Ans. 77 barrels.

17. If 4129 barrels of flour cost $26219.15, how much will 360 barrels cost? Ans. $2286.

18. If 8 pieces of cloth, each piece 35 yards, cost $996.80, what will be the price of 26 yards?

Ans. $92.56.

19. A person had $15000; he bought 30 bales of cotton, each bale 940 pounds, at 10 cents a pound; he paid $6680 for a house, and spent the remainder in flour, at $5.50 a barrel; how many barrels did he get?

Ans. 1000 barrels.

TABLES OF WEIGHTS, MEASURES, &c.

ART. 69.—ENGLISH OR STERLING MONEY.

4	Farthings	make	1 Penny,	abbreviated	*d.*
12	Pence	"	1 Shilling	"	*s.*
20	Shillings	"	1 Pound	"	*£.*

NOTE.—A sovereign is of the same value as a pound. A guinea is valued at 21 shillings.

Farthings are abbreviated thus:—

¼*d.* One farthing.
½*d.* Two farthings.
¾*d.* Three farthings.

ART. 70.—TROY WEIGHT.

24	Grains (*gr.*)	make	1 Pennyweight,	abbreviated	*dwt.*
20	Pennyweights	"	1 Ounce,	"	*oz.*
12	Ounces	"	1 Pound,	"	*lb.*

What is the use of Troy Weight?

Troy Weight is used to weigh jewels, gold, silver, and liquors.

ART. 71.—AVOIRDUPOIS WEIGHT.

16	Drams (*dr.*)	make	1 Ounce	abbreviated	*oz.*
16	Ounces	"	1 Pound	"	*lb*
25	Pounds	"	1 Quarter	"	*qr.*
4	Quarters	"	1 Hundred weight,	"	*cwt.*
20	Hundred weight	"	1 Ton,	"	*T.*

What is the use of Avoirdupois Weight?

Avoirdupois Weight is used to weigh coarse goods, such as groceries, and the metals, excepting gold and silver

NOTE.—5760 grains make one pound Troy; 7000 grains of the same kind make one pound Avoirdupois.

ART. 72.—APOTHECARIES' WEIGHT.

20	Grains (*gr.*)	make	1 Scruple,	abbreviated	℈.
3	Scruples	"	1 Dram,	"	ʒ.
8	Drams	"	1 Ounce,	"	℥.
12	Ounces	"	1 Pound,	"	℔.

What is the use of Apothecaries' Weight?

Apothecaries' Weight is used to mix medicines.

ART. 73.—CLOTH MEASURE.

$2\frac{1}{4}$	Inches (*in.*)	make	1 Nail,	abbreviated	*na.*
4	Nails	"	1 Quarter,	"	*qr.*
4	Quarters	"	1 Yard,	"	*yd.*
3	Quarters	"	1 Ell Flemish,	"	*E. Fl.*
5	Quarters	"	1 Ell English,	"	*E. E.*
6	Quarters	"	1 Ell French,	"	*E. Fr*
$1\frac{1}{12}$	Yards	"	1 Metre,	"	
$1\frac{1}{4}$	Yards	"	1 Aune,	"	

What is the use of Cloth Measure?

Cloth Measure is used to measure Dry Goods, Ribbons, &c.

NOTE.—French and German goods are generally invoiced by metres or aunes.

ART. 74.—LONG MEASURE.

12	Inches (*in.*)	make	1 Foot,	abbreviated,	*ft.*
3	Feet	"	1 Yard,	"	*yd.*
5½	Yards	"	1 Rod, or Pole,	"	*rd. or p*
40	Rods	"	1 Furlong,	"	*fur.*
8	Furlongs	"	1 Mile,	"	*m.*
3	Miles	"	1 League,	"	*l.*
69⅓	Miles (statute)	"	1 Degree of the equator.		
60	Miles (geographic)	"	1 Degree of the equator.		
360	Degrees	"	1 Circumference of the earth.		

What is the use of Long Measure?

Long Measure is used to measure distances, heights depths, &c.

ART. 75.—LAND OR SQUARE MEASURE.

144	Square Inches (*sq. in.*)	make	1 Square Foot,	ab'd.	*sq. ft.*
9	Square Feet	"	1 Square Yard,	"	*sq. yd.*
30¼	Square Yards	"	1 Square Rod or pole,	"	*sq. p.*
40	Square Poles	"	1 Rood,	"	*R.*
4	Roods	"	1 Acre,	"	*A.*
640	Acres	"	1 Square Mile,	"	*sq. m.*

What is the use of Land or Square Measure?

Land or Square Measure is used to measure land or the surface of anything that has length and breadth.

NOTE.—When length and breadth are multiplied together, the product represents a surface.

ART. 76.—SOLID OR CUBIC MEASURE.

1728	Cubic Inches (*sol. or cu. in.*)	make	1 Cubic Foot,	ab'd.	*cu. ft.*
27	Cubic Feet	"	1 Cubic Yard,	"	*cu. yd.*
40	Cubic Feet	"	1 Ton Round Timber,		*T. R.*
50	Cubic Feet	"	1 Ton Hewn Timber,		*T. H.*
42	Cubic Feet	"	1 Ton of Shipping,		*T.*
128	Cubic Feet	"	1 Cord of Wood,		*C.*

NOTE -A Cord of Wood is 8 feet long, 4 feet wide, and 4 feet high.

What is the use of Solid or Cubic Measure?

Solid or Cubic Measure is used to estimate the solid *contents of bodies that have length, breadth, and thickness, such as timber, stone, &c.*

Note.—When length, breadth, and thickness are multiplied together, the product represents a solid.

ART. 77.—CIRCULAR MEASURE.

60	Seconds ()	"	1	Minute,	abbreviated	′
60	Minutes	"	1	Degree,	"	°
30	Degrees	"	1	Sign,	"	*s.*
12	Signs or 360 degrees	make	1	Circle,	"	*c.*

ART. 78.—WINE MEASURE.

4	Gills (*gi.*)	make	1	Pint,	abbreviated,	*pt.*
2	Pints	"	1	Quart,	"	*qt.*
4	Quarts	"	1	Gallon,	"	*gal.*
31½	Gallons	"	1	Barrel,	"	*bbl.*
63	Gallons	"	1	Hogshead,	"	*hhd.*
2	Hogsheads	"	1	Pipe,	"	*pi.*
2	Pipes	"	1	Tun,	"	*tun.*

Note.—231 cubic inches make one gallon wine measure.

ART. 79.—BEER MEASURE.

2	Pints (*pt.*)	make	1	Quart,	abbreviated,	*qt.*
4	Quarts	"	1	Gallon,	"	*gal.*
36	Gallons	"	1	Barrel,	"	*bbl.*
54	Gallons	"	1	Hogshead,	"	*hhd.*

Note.—282 cubic inches make one gallon beer measure.

ART. 80.—DRY MEASURE.

2	Pints [*pt.*]	make	1	Quart,	abbreviated,	*qt.*
8	Quarts	"	1	Peck,	"	*pk.*
4	Pecks	"	1	Bushel,	"	*bu.*
8	Bushels	"	1	Quarter,	"	*qr.*
32	Bushels	"	1	Chaldron,	"	*ch.*

Note.—2150$\frac{4}{10}$ cubic inches make one bushel.

ART. 81.—TIME.

60	Seconds (*sec.*)	"	1	Minute,	abbreviated,	*min.*
60	Minutes	"	1	Hour,	"	*hr.*
24	Hours	"	1	Day,	"	*da.*
7	Days	"	1	Week,	"	*wk*
4	Weeks	"		Lunar month,	"	*mo.*
12	Calendar months	"		Year,	"	*yr.*
365¼	Days	"		Year	"	*yr.*

ART. 82.—MISCELLANEOUS TABLE.

12	Units	make	1	Dozen	
12	Dozen or 144	"	1	Gross.	
12	Gross or 1728	"	1	Great gross.	
20	Units	"	1	Score.	
56	Pounds	"	1	Firkin of butter	
100	Pounds	"	1	Quintal of fish.	
200	Pounds	"	1	Barrel of beef or pork.	
200	Pounds	"	1	Barrel of shad or salmon.	
196	Pounds	"	1	Barrel of flour.	
4	Inches	"	1	Hand,	used to measure the height of horses.
6	Feet	"	1	Fathom,	used for measuring the length of cordage and depth of water
24	Sheets of paper	"	1	Quire.	
20	Quires	"	1	Ream.	
2	Reams	"	1	Bundle.	
10	Bundles	"	1	Bale.	

SURVEYOR'S MEASURE.

$7\frac{92}{100}$	Inches	make	1	Link.
25	Links	"	1	Rod.
100	Links	"	1	Chain.
80	Chains	"	1	Mile.

LOCAL CURRENCIES OF THE UNITED STATES.

8	Shillings	make	$1	in N. Y., N. C., Ohio, and Michigan.
6	"	"	$1	in N. E., Va., Ky., Tenn., Ia., Ill., Mi., and Mo.
7½	"	"	$1	in Penn., N. J., Del., and Md.
4*s.* 8*d.*		"	$1	in Ga. and S. C.

In the other states Federal Money is generally used: 5 shillings of Canada or Nova Scotia money make $1 United States and 4s. 6d. sterling is the *nominal* value of $1 U. S.

REDUCTION.—DENOMINATE NUMBERS.

ART. 83. What is REDUCTION.

Reduction is the changing of a quantity from one denomination to another without altering the value.

Art. 84. How many kinds of reduction are there?

Two kinds: Reduction Ascending and Reduction Descending.

Art. 85. What is Reduction Descending?

Reduction Descending is the changing of a quantity from a higher to a lower denomination.

Art. 86. What is Reduction Ascending?

Reduction Ascending is the changing of a quantity from a lower to a higher denomination.

Art. 87. To reduce a denominate number from a higher to a lower denomination,

Rule.—*Multiply the highest denomination of the given quantity by as many of the denomination next lower as will make a unit of that denomination, and add in the next lower denomination if there be any: multiply this result as before, and so proceed until the whole is reduced to the denomination required.*

Art. 88. To reduce a denominate number from a lower to a higher denomination,

Rule.—*Divide the given quantity by as many of its own denomination as will make a unit of the denomination next higher; divide this result as before, and so proceed until the whole is reduced to the denomination required; if there be remainders they will be of the same denomination as the divisor or dividend.*

EXAMPLES—STERLING MONEY.

1. Reduce £14 to shillings and pence.
Ans. 280*s.* 3360*d.*
2. Reduce £255 to shillings and pence.
Ans. 5100*s.* 61200*d.*
3. Reduce £3472 to shillings and pence.
Ans. 69440*s.* 833280*d.*

4. Reduce £12 [illegible] to shillings.
Ans. 246s.

5. Reduce [illegible] to farthings.
Ans. 1766 farthings.

6. Reduce £[illegible] [illegible] to pence.
Ans. 270400d.

7. Reduce £[illegible] [illegible] to farthings.
Ans. 945635 far.

8. Reduce [illegible] to farthings.
Ans. 753 farthings.

9. Reduce [illegible] pence to shillings.
Ans. 15s. 6d.

10. Reduce 489 shillings to pounds.
Ans. £244 16s.

11. Reduce [illegible] pence to pounds.
Ans. £56 11s. 2d.

12. Reduce 40[illegible] pence to pounds.
Ans. £161 16s. 1d.

13. Reduce [illegible] farthings to shillings.
Ans. 16s. 3¼d.

14. Reduce [illegible] farthings to pounds.
Ans. £[illegible] 16s. 1¾d.

TROY WEIGHT.

15. How many pennyweights in a pound?
Ans. 240 dwt.

16. How many grains in a pound?
Ans. 5760 grains.

17. Reduce [illegible] pounds to ounces.
Ans. [illegible] ounces.

18. Reduce 18 lb. 4 oz. to dwt.
Ans. [illegible] dwt.

19. Reduce 11 oz. 13 dwt. to grains.
Ans. [illegible] gr.

20. Reduce 614 lb. to grains. Ans. 3536640 gr.

21. Reduce 23 lb. 7 oz. 15 dwt. to grains.
Ans. 136296 gr.

22. Reduce 61 lb. 12 dwt. 16 gr. to grains.
Ans. 351688 gr.

23. Reduce 4860 dwt. to ounces. Ans. 243 oz.

24. Reduce 9818 dwt. to pounds.
Ans. 40 lb. 10 oz. 18 dwt.

25. Reduce 7815 oz. to pounds.
Ans. 651 lb. 3 oz.

26. Reduce 96388 grains to pounds.
Ans. 16 lb. 8 oz. 16 dwt. 4 gr.

27. Reduce 386245 grains to pounds.
Ans. 67 lb. 0 oz. 13 dwt. 13 gr.

28. How many quarters make a ton? Ans. 80.

AVOIRDUPOIS WEIGHT.

29. How many pounds make a cwt. and ton?
Ans. 100 lb. a cwt. 2000 lb. a ton.

30. How many ounces make a quarter, cwt., and ton?
Ans.

31. How many drams make a quarter, cwt., and ton?
Ans.

32. Reduce 75 tons to pounds. Ans. 150000 lb.

33. Reduce 15 cwt. 3 qr. 21 lb. to pounds.
Ans. 1596 lb.

34. Reduce 14 lb. 13 dr. to drams.
Ans. 3597 dr.

35. Reduce 13 T. 3 qr. 19 lb. to drams.
Ans. 6680064 dr.

36. Reduce 44 cwt. 1 qr. 12 oz. to drams.
Ans. 1132992 dr.

37. Reduce 2560 drams to pounds.
Ans. 10 lb.

38. Reduce 2598 lb. to cwt.
Ans. 25 cwt. 3 qr. 23 lb.

39 Reduce 15724 dr. to cwt.
Ans. 2 qr. 11 lb. 6 oz. 12 dr

40. Reduce 55200 lb. to tons.
Ans. 27 T. 12 cwt.

41. Reduce 18608129 drams to tons.
Ans. 36 T. 6 cwt. 3 qr. 13 lb. 1 dr.

42. Reduce 1000000 ounces to tons.
Ans. 31 T. 5 cwt.

APOTHECARIES' WEIGHT.

43. How many ʒ make a pound? Ans. 96 ʒ

44. How many scruples make an ℥ and lb.?
Ans. 24 ℈ in an ℥, 288 ℈ in a lb.

45. How many grains make a ʒ, ℥, and lb.?
Ans. 60 gr. in a ʒ, 480 gr. in a ℥, 5760 gr. in a lb.

46. Reduce 472 lb. to ʒ.
Ans. 45312 ʒ.

47. Reduce 38 lb. 6 ℥, 3 ʒ, 2 ℈, to grains.
Ans. 221980 gr.

48. Reduce 7 ℥, 1 ℈, 12 gr. to grains.
Ans. 3392 gr.

49. Reduce 3676 ʒ to pounds.
Ans. 38 lb. 3 ℥, 4 ʒ.

50. Reduce 73611 gr. to pounds.
Ans. 12 lb. 9 ℥, 2 ʒ, 2 ℈ 11 gr.

51. Reduce 1000000 gr. to pounds.
Ans. 173 lb., 7 ℥, 2 ʒ, 2 ℈.

52. Reduce 79 lb. 3 ℥, 1 ʒ, 1 ℈, 15 gr. to gr.
Ans. 456575 gr.

CLOTH MEASURE.

53. How many nails in a yard. (Art. 59.)
Ans. 16 na.

54. How many inches in a yard? Ans. 36 in.

55 Reduce 27 yards to nails. Ans. 432 na.

56. Reduce 15 E. E. to nails. Ans. 300 na.

57. Reduce 30 E. E. to inches. (Art. 59.)
Ans. 1350 in

58. Reduce 293 E. Fr. to inches. Ans. 15822 in.

59. Reduce 1753 na. to E. Fr.
Ans. 73 E. Fr., 1 na

60. Reduce 7412 in. to yards. (Art. 61.)
Ans. 205 yd. 3 qr. 2 na. $\frac{1}{4}$ in

61. Reduce 3298 in. to E. E.
Ans. 73 E. E. 1 qr. 1 na. $1\frac{3}{4}$ in

62. Reduce 1411 in. to E. Fr.
Ans. 26 E. Fr. 0 qr. 3 na. $\frac{1}{4}$ in

LONG MEASURE.

63. How many furlongs make a degree?
Ans. 556 fur.

64. How many rods make a degree and a mile?
Ans. 22240 rd. in a deg. and 320 rd. in a m.

65. How many yards make a degree and a mile?
Ans. 122320 yd. in a deg. and 1760 yd. in a m.

66. How many inches make a mile?
Ans. 63360 in.

67. How many inches in 79 yards. Ans. 2844 in.

68. How many rods in 73 miles?
Ans. 23360 rd.

69. How many inches in 15 yd. 7 in.
Ans. 547 in.

70. Reduce 18m. 3 fur. 27 poles to poles.
Ans. 5907 p.

71. Reduce 16 deg. 19 m. 3 fur. to rods. (Art. 59.)
Ans. 362040 rd.

72. Reduce 37 fur. 11 rods to inches.
Ans. 295218 inches.

73. Reduce 145 miles to feet. Ans. 765600 feet.

74. Reduce 19 m. 5 fur. 12 p. 3 yd. to feet.
Ans. 103827 feet.

75. Reduce 79 deg. 41 m. to inches.
Ans. 350475840 inches.

76. Reduce 1277 inches to yards.
Ans. 35 yd. 1 ft. 5 in.

77. Reduce 4006 poles to miles.
Ans. 12 m. 4 fur. 6 p.

78. Reduce 176 yd. to rods. Ans. 32 rods.

79. Reduce 1473 statute miles to degrees.
Ans. 21 deg. 13 m. 4 fur.

80. Reduce 11492 in. to furlongs.
Ans. 1 fur. 18 rd. 8 in.

81. Reduce 1000000 ft. to miles.
Ans. 189 m 3 fur. 6 rd. 1 ft.

82. Reduce 753689 yd. to degrees.
Ans. 6 deg. 11 m. 1 fur. 34 rd. 2 yd

83. Reduce 7706160 ft. to degrees.
Ans. 20. deg. 69 m. 4 fur. or 21 deg.

LAND OR SQUARE MEASURE.

84. Reduce 18 acres to square poles.
Ans. 2880 sq. p.

85. In one square mile how many roods?
Ans. 2560 roods.

86. How many square rods make a square mile?
Ans. 102400 sq. rd.

87. How many square feet make an acre?
Ans. 43560 sq. ft.

88. Reduce 450 square yards to square inches.
Ans. 583200 sq. in.

89. In 13 A. 3 R. 15 sq. p., how many square yards.
Ans. $67003\frac{3}{4}$ sq. yd.

90. In 144 sq. m. 54 A. 28 sq. p., how many square poles?
Ans. 14754268 sq. p.

91. In 37 roods, how many square inches?
Ans. 58021920 sq. in.

92. Reduce 13796 sq. in. to square yards.
Ans. 10 sq. yd. 5 sq. ft. 116 sq. in.

93. Reduce 196441 square poles to square miles.
Ans. 1 sq. m. 587 A. 3 R. 1 sq. p.

94. Reduce 7800 sq. ft. to square rods.
Ans. 28 sq. rd. 19 sq. yd. 6 sq. ft.

95. Reduce 20000000 square feet to acres.
Ans. 459 A. 21 sq. p. $26\frac{3}{4}$ sq. yd. 2 sq. ft., or 459 A. 21 sq. p. 26 sq. yd. 8 sq. ft. 108 sq. in.

96. A piece of ground is 50 yards long and 25 yards wide, how many square yards are there in the surface?
Ans. 1250 sq. yd.

97. One side of a square box is 3 ft. long and 2 ft. high, how many square feet are in the four sides?
Ans. 24 sq. ft.

SOLID OR CUBIC MEASURE.

98. In 1 cord how many solid inches?
Ans. 221184 cu. in.

99. Reduce 4 tons of round timber to cubic inches.
Ans. 276480 cu. in.

100. Reduce 7 tons of hewn timber to cubic inches.
Ans. 604800 cu. in.

101. In 4866 cubic feet, how many cords?
Ans. 38 c. 2 cu. ft.

102. In 1347629 cubic inches, how many tons of round timber? Ans. 19 T. 19 cu. ft. 1517 cu. in.

103. In 44 tons round timber and 13 solid feet, how many cubic inches? Ans. 3063744 cu. in.

104. In 256 cu. yd. 15 cu. ft. 1000 cu. in., how many cubic inches? Ans. 11970856 cu. in.

105. In a box 5 feet long, 4 feet wide and3 feet high, how many solid feet? Ans. 60 solid ft.

LIQUID MEASURE.

106. Reduce 1 tun to quarts. Ans. 1008 qt.

107. Reduce one hogshead to gills.
Ans. 2016 gi.

108. Reduce 6 barrels to gills. Ans. 6048 gi.

109. Reduce 55 gal. 3 qt. 2 gi. to gills.
Ans. 1786 gi

110. Reduce 14 pipes, 76 gal. 1 pt. to pints.
Ans. 14721 pt.

111. Reduce 315 hhd. 29 gal. 1 pt. to gills.
Ans. 635972 gi.

112. Reduce 13000 pints to hogsheads.
Ans. 25 hhds. 50 gal.

113. Reduce 17867 gills to barrels.
Ans. 17 bbls. 22 gal. 3 qt. 3 gi.

114. Reduce 11002 gal. to barrels.
Ans. 349 bbl. 8 gal. 2 qt.

115. Reduce 71561 pt. to tuns.
Ans. 35 T. 1 hhd. 62 gal. 1 pt.

116. Reduce 17598 pints to barrels, beer measure.
Ans. 61 bbl. 3 gal. 3 qt.

DRY MEASURE.

117. Reduce 1 bushel to pints. Ans. 64 pt.

118. Reduce 13 bu. 2 pk. 7 qt. to quarts.
Ans. 439 qt.

119. Reduce 9 ch. 23 bu. to pints. Ans. 19904 pt.

120. In 16751 pt., how many bushels?

121. Reduce 4001 pecks to chaldrons.
Ans. 31 ch. 8 bu. 1 pk.

122. Reduce 13757 qt. to chaldrons.
Ans. 13 ch. 13 bu. 3 pk. 5 qt.

123. In 34 ch. 5 bu. 3 pks. 7 qt., how many quarts?
Ans. 35007 qt.

TIME.

124. Reduce 365 da. 6 hr. or one year to hours.
Ans. 8766 hr.

125. Reduce a century to days. Ans. 36525 days.

126. In one week, how many minutes?
Ans. 10080 min.

127. In one year, how many minutes?
Ans. 525960 min.

128. Reduce 5 yr. 73 da. 11 hr. to hours.
Ans. 45593 hr.

129. Reduce 7 wk. 2 da. 14 hr. to minutes.
Ans. 74280 min.

130. Reduce 7300 hr. to weeks.
Ans. 43 wk. 3 da. 4 hr.

131. Reduce 179963 seconds to days.
Ans. 2 da. 1 hr. 59 min. 23 sec.

132. Reduce 36875 hours to years, each year 365¼ days. Ans. 4 yr. 75 da. 11 hr.

133. Reduce 67981861 min. to centuries.
Ans. 1 cent. 29 yr. 92 da. 9 hr. 1 min.

CIRCULAR MEASURE.

134. Reduce a circle to minutes and seconds.
Ans. 21600 min. 1296000 sec.

135. Reduce 3 signs to minutes and seconds.
Ans. 5400 min. 324000 sec.

136. Reduce 16° 31′ 30″ to seconds. Ans. 59490″.

137. Reduce 7 signs 29° 11′ to seconds. Ans. 861060″.

138. Reduce 360060″ to degrees. Ans. 100° 1′.

139. Reduce 700000″ to signs. Ans. 6 signs 14° 26′ 40″.

140. In 496820′, how many circles? Ans. 23 cir. 20′.

PROMISCUOUS EXAMPLES.

1. In 7 quires of paper, how many sheets? Ans. 168.

2. In 14 barrels of beef, how many pounds? Ans. 2800 lb.

3. The depth of a river is 17 fathoms: how many inches is that? Ans. 1224 in.

4. A horse is 17½ hands high; how many inches is that? Ans. 70 inches.

5. How many sheets in a ream of paper? Ans. 480 sheets.

6. If 3416 lbs. of butter are to be put in firkins of 56lb. each, how many firkins will be required? Ans. 61 firkins.

7. A person wishes to pack 16 head of cattle, which average 3000 lb. each of packing beef; how many barrels, each containing 200 lb., will he require? Ans. 240 barrels.

8. How many pens in 35 gross? Ans. 5040 pens.

9. How many buttons in 568 gross? Ans. 81792 buttons.

10. What is the price of 18 cwt. 3 qr. 16 lb., at 2 cents a pound? Ans. $37.82.

11. A hhd. of sugar weighs 11 cwt. 2 qr. 26 lb.; what will it cost, at 7 cents a pound? Ans. $82.32.

12 If a room is 18 feet long, and 16 feet wide, how much will it cost to carpet, at $1 20 per square yard? Ans. 38.40.

APOTHECARIES' WEIGHT.

43. How many ʒ make a pound? Ans. 96 ʒ

44. How many scruples make an ℥ and lb.?
Ans. 24 ℈ in an ℥, 288 ℈ in a lb

45. How many grains make a ʒ, ℥, and lb.?
Ans. 60 gr. in a ʒ, 480 gr. in a ℥, 5760 gr. in a lb

46. Reduce 472 lb. to ʒ.
Ans. 45312 ʒ.

47. Reduce 38 lb. 6 ℥, 3 ʒ, 2 ℈, to grains.
Ans. 221980 gr.

48. Reduce 7 ℥, 1 ℈, 12 gr. to grains.
Ans. 3392 gr.

49. Reduce 3676 ʒ to pounds.
Ans. 38 lb. 3 ℥, 4 ʒ.

50. Reduce 73611 gr. to pounds.
Ans. 12 lb. 9 ℥, 2 ʒ, 2 ℈ 11 gr.

51. Reduce 1000000 gr. to pounds.
Ans. 173 lb., 7 ℥, 2 ʒ, 2 ℈.

52. Reduce 79 lb. 3 ℥, 1 ʒ, 1 ℈, 15 gr. to gr.
Ans. 456575 gr.

CLOTH MEASURE.

53. How many nails in a yard. (Art. 59.)
Ans. 16 na.

54. How many inches in a yard? Ans. 36 in.

55 Reduce 27 yards to nails. Ans. 432 na.

56. Reduce 15 E. E. to nails. Ans. 300 na.

57. Reduce 30 E. E. to inches. (Art. 59.)
Ans. 1350 in

58. Reduce 293 E. Fr. to inches. Ans. 15822 in.

59. Reduce 1753 na. to E. Fr.
Ans. 73 E. Fr., 1 na

60. Reduce 7412 in. to yards. (Art. 61.)
Ans. 205 yd. 3 qr. 2 na. ¼ in

61. Reduce 3298 in. to E. E.
Ans. 73 E. E. 1 qr. 1 na. 1¾ in

62. Reduce 1411 in. to E. Fr.
Ans. 26 E. Fr. 0 qr. 3 na. ¼ in

LONG MEASURE.

63. How many furlongs make a degree?
Ans. 556 fur.

64. How many rods make a degree and a mile?
Ans. 22240 rd. in a deg. and 320 rd. in a m.

65. How many yards make a degree and a mile?
Ans. 122320 yd. in a deg. and 1760 yd. in a m.

66. How many inches make a mile?
Ans. 63360 in.

67. How many inches in 79 yards. Ans. 2844 in.

68. How many rods in 73 miles?
Ans. 23360 rd.

69. How many inches in 15 yd. 7 in.
Ans. 547 in.

70. Reduce 18m. 3 fur. 27 poles to poles.
Ans. 5907 p.

71. Reduce 16 deg. 19 m. 3 fur. to rods. (Art. 59.)
Ans. 362040 rd.

72. Reduce 37 fur. 11 rods to inches.
Ans. 295218 inches.

73. Reduce 145 miles to feet. Ans. 765600 feet.

74. Reduce 19 m. 5 fur. 12 p. 3 yd. to feet.
Ans. 103827 feet.

75. Reduce 79 deg. 41 m. to inches.
Ans. 350475840 inches.

76. Reduce 1277 inches to yards.
Ans. 35 yd. 1 ft. 5 in.

77. Reduce 4006 poles to miles.
Ans. 12 m. 4 fur. 6 p.

78. Reduce 176 yd. to rods. Ans. 32 rods.

79. Reduce 1473 statute miles to degrees.
Ans. 21 deg. 13 m. 4 fur.

80. Reduce 11492 in. to furlongs.
Ans. 1 fur. 18 rd. 8 in.

81. Reduce 1000000 ft. to miles.
Ans. 189 m 3 fur. 6 rd. 1 ft.

82. Reduce 753689 yd. to degrees.
Ans. 6 deg. 11 m. 1 fur. 34 rd. 2 yd

83. Reduce 7706160 ft. to degrees.
Ans. 20. deg. 69 m. 4 fur. or 21 deg.

LAND OR SQUARE MEASURE.

84. Reduce 18 acres to square poles.
Ans. 2880 sq. p.

85. In one square mile how many roods?
Ans. 2560 roods.

86. How many square rods make a square mile?
Ans. 102400 sq. rd.

87. How many square feet make an acre?
Ans. 43560 sq. ft.

88. Reduce 450 square yards to square inches.
Ans. 583200 sq. in.

89. In 13 A. 3 R. 15 sq. p., how many square yards.
Ans. $67003\frac{3}{4}$ sq. yd.

90. In 144 sq. m. 54 A. 28 sq. p., how many square poles?
Ans. 14754268 sq. p.

91. In 37 roods, how many square inches?
Ans. 58021920 sq. in.

92. Reduce 13796 sq. in. to square yards.
Ans. 10 sq. yd. 5 sq. ft. 116 sq. in.

93. Reduce 196441 square poles to square miles.
Ans. 1 sq. m. 587 A. 3 R. 1 sq. p.

94. Reduce 7800 sq. ft. to square rods.
Ans. 28 sq. rd. 19 sq. yd. 6 sq. ft.

95. Reduce 20000000 square feet to acres.
Ans. 459 A. 21 sq. p. $26\frac{3}{4}$ sq. yd. 2 sq. ft., or 459 A. 21 sq. p. 26 sq. yd. 8 sq. ft. 108 sq. in.

96. A piece of ground is 50 yards long and 25 yards wide, how many square yards are there in the surface?
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140. In 496820′, how many circles?
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PROMISCUOUS EXAMPLES.

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9. How many buttons in 568 gross?
Ans. 81792 buttons.

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11. A hhd. of sugar weighs 11 cwt. 2 qr. 26 lb.; what will it cost, at 7 cents a pound? Ans. $82.32.

12 If a room is 18 feet long, and 16 feet wide, how much will it cost to carpet, at $1 20 per square yard?
Ans. 38.40.

13. How many bottles, each holding 1 pt. 3 gi. will be required to bottle 3 pipes of wine?
Ans. 1728 bottles.

14. How long is a piece of ground which is 64 yd. wide and contains 176 acres? Ans. 13310 yd.

15. A pile of wood is 8 feet high, 4 feet deep, and 168 feet long; what will it be worth at $7 a cord?
Ans. $294.

16. How many yards of flannel, 1 yd. 2 qr. wide, will line a cloak 2 yd. long and 6 yd. wide?
Ans. 8 yd.

17. How many spoons, each weighing 2 oz. 13 dwt., can be made from a lump of silver weighing 2 lb. 10 oz. 9 dwt? Ans. 13 spoons.

18. A person owes £168 13*s.* 10½*d*; he gives 20 barrels of flour, each worth £2 10*s.* 6d., and the rest in money; how much money must he pay?
Ans. £118 3*s.* 10½*d.*

19. I want to bottle 15 gallons of wine in an equal number of quart and pint bottles; how many of each must I have? Ans. 40 qt. and 40 pt. bottles.

20. Divide 16 barrels of flour, each weighing 196 lb., into 20 parcels of 14 lb. each, and the rest into parcels of 7 lb. each; how many of these latter parcels are there? Ans. 408 parcels.

21. Divide a hhd. of sugar containing 1400 lb. into an equal number of parcels, of 18, 10, and 7 each; how many will there be? Ans. 40 of each.

22. How many bottles does it take to put 165 gal. 1 pt. 1 gi. into bottles holding 1 pt. 3 gi. each?
Ans. 755 bottles.

23. A Jeweller has 7 lb. 11 oz. 1 dwt. 20 gr. which he wants to make into spoons; 10 spoons, each 2 oz. 11 dwt. 14 gr; 25 spoons, each 1 oz. 4 dwt., and the rest into spoons, each 1 oz. 12 dwt. 18 gr; how many are there of this last weight? Ans. 24 spoons.

24. A person has 18 cwt. 3 qr. of sugar, worth 8 cts. a pound, which he exchanged for cloth at $5 per yard; how much cloth did he get? Ans. 30 yd.

REDUCTION OF CURRENCIES.

Art. 89. To reduce Federal Money to the various State currencies.

Rule.—*Multiply the given amount of Federal Money by the value of* \$1, *expressed either in shillings or pence; if the sum contain cents, divide the product by* 100; *or if it contain mills, divide the product by* 1000, *and the quotient will always be of the same denomination as that in which the value of* \$1 *is expressed.*

Note.—£. *s.* *d.*, with the various divisions of a dollar into shillings and pence, were employed in keeping accounts in the States, previous to the Revolution, and they are still used to a limited extent. In those States, whose names are not down in the table of currencies, Federal Money only is used.

1. In \$59, how many pounds New York currency?
Ans. £23 12*s.*

2. In \$279.75, how many pounds New York currency? Ans. £111 18*s.*

3. Reduce \$4861.275, to pounds New York currency.
Ans. £1944 10*s.* $2\frac{1}{4}$*d.*

4. Reduce \$61.75 to pounds New England currency.
Ans. £18 10*s.* 6*d.*

5. In \$581.15, how many pounds New Jersey currency? Ans. £217 18*s.* $7\frac{1}{2}$*d.*

6. How many pounds, South Carolina currency, in \$2813.665? Ans. £656 10*s.* $5\frac{1}{4}$.

7. Reduce 75 cents to shillings, New England currency. Ans. 4*s.* 6*d.*

8. How many pounds, New England currency, will 275 barrels of flour cost, at \$5.50 a barrel?
Ans. £453 15*s.*

9. How many pounds, Pennsylvania currency, will 1760 bushels of wheat cost at $92\frac{1}{2}$ cents a bushel?
Ans. £610 10*s.*

10. What will be the price, in pounds, New York currency, of 5 hhds. of sugar, each weighing 1321 lbs., at 7 cents a pound? Ans. £184 18*s.* $9\frac{3}{5}$*d.*

11. How many pounds, South Carolina currency, will

pay for 13 T. 15 cwt. 28 lbs. of iron at 4½ cents a pound? Ans. £289 0*s.* 10½*d.*

12. How much money, Canada currency, will pay for 755 bushels of wheat, valued at $1.20 a bushel? Ans. £226 10*s.*

ART. 90. To reduce the various State Currencies to Federal Money.

RULE.—*Divide the given amount by the value of* $1, *both reduced to the same denomination, the quotient will be dollars; multiply the remainder, if any, by* 100 *and continue to divide, in order to obtain the cents, &c.*

13. In £25, New York currency, how many dollars? Ans. $62.50.

14. How many dollars in £15 4*s.*, New York currency? Ans. $38.

15. Reduce £186 13*s.* 9*d.*, New York currency, to Federel Money. Ans. $466.72 (nearly.)

16. In £759 16*s.* 8¾ South Carolina currency, how much Federal Money? Ans. $3256.44.

17. Reduce £992 15*s.* 7*d.*, Pennsylvania currency, to Federal Money. Ans. $2647.41.

18. Reduce 3*s.* 5*d.*, New England currency to Federal Money. Ans. 57 cents (nearly.)

19. How many dollars and cents in £211 8*s.* 10*d.*, Canada currency? Ans. $845.77.

20. In £296 13*s.* 4*d.*, New Jersey currency, how many dollars and cents? Ans. $791.11.

21. Reduce 51*s.* 7½*d.*, Virginia currency to Federal Money. Ans. $8.465.

DENOMINATE NUMBERS.—ADDITION.

Art. 91. To Add Denominate Numbers.

Rule.—*Write the numbers with the like denominations under each other; commence at the column of the lowest denomination, add it up, and if the sum be less than a unit of the next higher denomination, set it down under the column added; if it be more than a unit of the next higher denomination, reduce it to the next higher denomination, place the remainder under the column added, and carry the quotient to the column of the next higher denomination; proceed with each column in the same manner to the last, the total amount of which must be set down.*

(1.)

	£	s.	d.
Add	17	3	6
	18	4	9
	17	11	6
	29	18	9
	16	11	3
	99	9	9

(2.)

£	s.	d.
145	0	9½
169	17	8
175	14	7¼
166	15	8¾
1199	5	10
1856	14	7½

(3.)

£	s.	d.
487	12	1¼
399	15	2½
456	1	1¾
798	19	3¼
100	10	1
2242	17	9¾

(4.)

lb.	oz.	dwt.
196	11	19
44	6	16
55	10	15
144	9	8
169	5	2
611	8	0

(5.)

lb.	oz.	dwt.	gr.
986	4	2	11
68	5	1	21
44	7	0	16
288	11	4	22
6	9	1	14
1395	0	11	12

(6.)

Tons.	cwt.	qr.	lb.
55	16	1	17
14	11	2	5
63	19	3	24
919	6	1	20
89	1	3	4
299	15	2	16
1442	11	3	11

(7.)

cwt.	qr.	lb.	oz.	dr.
75	2	16	15	15
94	3	6	6	11
88	1	15	11	9
3	1	24	10	11
900	3	16	9	1
44	1	20	2	1[illegible]

(8.)

℔	℥	ʒ	℈	*gr.*
12	6	5	1	16
94	5	6	2	19
6	9	2	1	15
17	11	7	2	16
	10	5	0	11
290	6	4	1	15
150	8	2	2	19
75	6	7	1	14

(9.)

℥	ʒ	℈	*gr.*
11	5	1	20
11	2	2	15
93	6	1	23
5	7	0	20
66	5	1	15
33	4	2	12
19	6	1	15
11	1	0	12

(10.)

yd.	qr.	na.
296	3	3
45	1	2
711	1	1
44	3	2
17	1	3

(11.)

E. E.	qr.	na.	in.
196	4	1	1
44	3	1	2
13	2	3	1
166	2	1	2
154	3	3	1
576	2	0	0¼

(12.)

L.	m.	fur.	p.
73	2	5	29
688	1	7	11
95	2	7	20
136	1	6	10
	2	4	39
1	1	7	14
200	2	6	5
19	1	7	2

(13.)

yd.	ft.	in.
79	2	11
68	1	10
196	2	9
77	1	1
14	2	10
51	2	6
19	1	8
16	2	3

(14.)

m.	fur.	po	yd.
77	5	13	4
186	3	10	2
69	3	28	3
771	2	29	2
46	7	30	3
175	1	26	1
	5	0	1
1327	5	18	5

(15.)

deg.	m.	fur.	
28	59	5	
22	38	6	
41	58	7	
11	38	1	
	57	2	
76	53	4	
1	41	3	
183	69	4	or
184			

(16.)

A.	R.	sq. p.
17	3	13
98	2	17
55	1	27
14	4	9
75	1	

(17.)

sq. rods.	sq. yd.	sq. ft.	sq. in.
19	15	8	111
4	25	8	126
198	15	2	100
5	3	8	7
15	12	5	29
243	12½	6	85

(18.)

m.	A.	R.	sq. p.	sq. yd.
50	75	1	30	15
791	11	2	15	11
87	345	3	31	16
75	473	1	29	30
15	29	2	18	26
.019	296	0	6	7¼

(19.)

sq. yd.	sq. ft.	sq. in.
96	8	100
7	5	126
15	3	49
711	7	66
28	7	1

(20)

C.	cu. ft.	cu. in.
30	12	169
17	108	1229
13	64	786
29	14	1500
1	112	36

(21.)

sol. yd.	sol. ft.	sol. in
18	24	1600
29	14	1706
188	13	497
54	19	296
496	15	1081

(22.)

hhd.	gal.	qt.	pt
79	62	3	1
3	59	2	0
61	13	2	1
159	4	1	1
66	27	0	0

(23.)

gal.	qt.	pt.	gi.
49	2	1	3
71	3	0	2
6	1	1	1
16	3	1	3
68	3	1	2

(24.)

bu.	pk.	qt.	pt.
91	3	7	1
14	3	5	1
17	2	3	0
68	3	1	1
9	1	6	1

(25.)

chal.	bu.	pk.
29	27	2
168	17	1
75	23	3
15	11	1
861	12	2

(26.)

W.	da.	hr.
3	6	14
17	4	20
39	2	16
29	6	5
18	1	23

(27.)

yr.	mo.	da.
17	5	20
16	2	11
112	3	15
9	11	12
5	10	21

(28.)

signs.	°	′	″
2	14	50	50
3	11	15	41
1	25	44	46
	18	35	36
	24	11	49
4	5	10	55

(29.)

°	′	″
37	50	12
15	11	21
16	19	29
4	54	16
17	29	48
6	47	35

30. A person owes several sums of money; to one 17*s.* 6*d.*; to another, £3 5*s.* 8*d.*; to another, £25 11*s.* 10½*d.*; to another, £12 8*d.*; to another, 16*s.* 3¾*d.*; to another, £126 4*s.*; to another, £31 6s. 10¼*d.*; to another, £50 4*s.* 4¾*d.* What is the whole amount?

Ans. £250 7*s.* 3½*d.*

31. A person has 5 pieces of ground; the first contains 16 A. 3 R.; the second, 17 A. 1 R. 1 sq. p. 45 sq. feet; the third, 11 A. 14 sq. p. 62 sq. feet; the fourth, 2 A. 3 R. 120 sq. ft.; and the fifth, 41 A. 2 R. 7 sq. p. What is the amount of the whole?

Ans. 89 A. 1 R. 22 sq. P. 227 sq. ft.

32. Off of one field of wheat were raised 37 bu. 1 pk. 3 qt.; of a second field, 41 bu. 2 pk. 5 qt.; of a third, 35 bu. 1 pk. 3 qt.; of a fourth, 43 bu. 3 pk. 1 qt. How much was the whole?

Ans. 158 bu. 4 qt.

33. A person travelling, goes 26 m. 3 fur. 12 rd., the first day; 28 m. 5 fur. 9 rd. 9 ft. the second day; 31 m. 15 rd. 14 ft. the third day; 26 m. 7 fur. 12 ft. the fourth day; and 33 m. 7 fur. 16 rd. 11 ft. the fifth day. How far does he go during the 5 days?
Ans. 146 m. 7 fur. 14 rd. 13 ft.

34. A jeweller receives on one day 11 lb. 6 oz. of gold; on another day, 10 lb. 5 oz. 20 gr.; on another, 6 oz. 3 dwt. 16 gr.; on another, 5 lb. 17 dwt. 1 gr.; on another, 16 lb. 4 oz. 15 dwt. 15 gr. How much does he receive in all? Ans. 43 lb. 10 oz. 17 dwt. 4 gr.

35. A grocer received an invoice of 7 hhd. of sugar; the first weighed 11 cwt. 15 lb.; the second, 12 cwt. 3 qr. 15 lb.; the third, 9 cwt. 1 qr. 16 lb.; the fourth, 12 cwt. 1 qr.; the fifth, 11 cwt. 3 qr. 24 lb.; the sixth, 9 cwt. 24 lb.; the seventh, 13 cwt. How much did the seven hogsheads contain? Ans. 79 cwt. 3 qr. 19lb.

SUBTRACTION.

Art. 92. To Subtract Denominate Numbers.

Rule.—*Write the like denominations of the subtrahend under those of the minuend; commence at the lowest denominator, and subtract the lower number from the one above, and set down the remainder under that denomination; if the number below be more than the one above, add to the upper number as many of its own denomination as it takes to make a unit of the next higher, and from the sum take the number below; set down the difference, and carry one to the under number of the next higher denomination, and proceed with it as before.*

	(1.)			(2.)		
	£	*s.*	*d.*	£	*s.*	*d.*
From	17	13	9	1918	11	8½
Take	13	17	6	819	6	9¼
	3	16	3	1099	4	11¼

(3.)

£.	s.	d.
186	4	0¼
98	11	2¾

(4.)

lb.	oz.	dwt.	gr.
114	3	16	12
91	4	12	19

(5.)

tons	cwt.	qr.	lb.	oz.
75	16	3	14	14
74	19	2	11	15

(6.)

cwt.	qr.	lb.	oz.	dr.
58	1	16	2	5
27	1	20	1	6

(7.)

℔	℥	ʒ	℈	gr.
68	1	7	2	12
15	0	7	2	15

(8.)

yd.	qr.	na.
168	2	1
165	3	3

(9.)

F. E.	qr.	na.	in.
73	4	1	1
17	3	0	2
56	1	0	1¼

(10.)

L.	m.	fur.	p.
16	2	5	12
13	1	6	19

(11)

m.	fur.	p.	ft.
15	3	28	3
4	5	22	5
10	6	5	14½

(12.)

rd.	yd.	ft.	in.
16	5	1	11
14	5	2	9
1	4½	2	2 or
1	0	8	

(13.

Deg.	m.	fur.	
110	49	2	
43	60	3	
66	57½	7	or
66	58	3	

(14.)

Deg.	m.	fur	rd	
16	69	3	15	
15	69	6	12	
	68½	5	3	or
	69	1	3	

(15.)

sq. m.	A.	R.	sq. p.
136	410	3	20
11	132	2	19

(16.)

A.	R.	sq. p.	sq. yd.
75	2	14	11
73	3	10	16
1	3	3	25¼

(17.)

sq. yd.	sq. ft.	sq. in.
37	4	110
6	7	132

(18.)

C.	cu. ft.	cu. in.
178	112	1689
41	125	1398

(19.)

sol. yd.	sol. ft.	sol. in.
37	15	1000
6	25	1307

(20.)

pi.	gal.	qt.	pt.
16	79	2	1
11	88	4	1

(21.)

T.	gal.	qt.	pt.	gi.
14	16	1	1	3
4	200	2	1	3
9	67	3	0	0

(22.)

ch.	bu.	pk.	qt
15	14	2	3
98	25	3	2
16	20	3	1

(23.)

yr.	mo.	da.
1845	7	12
1832	8	20

(24.)

yr.	mo.	da.
1799	11	2
1789	4	19

(25.)

W.	da.	hr.	min.	sec.
44	1	20	16	48
35	1	23	11	59

(26.)

C.	sign.	°	′	″
1	0	0	0	0
	8	12	49	59

(27.)

sign.	°	′	″
11	14	16	29
4	25	46	24

28. A person owes £78 3*s*. 2¼*d*.; he pays £17 17*s*. 1¾*d*.; how much does he still owe?

Ans. £60 6*s*. 0½*d*.

29. A owes B for 2 invoices of merchandise; one worth £17 16*s*. 8½*d*., the other £11 2*s*. 9*d*.; he pays £25 16*s*. 4*d*.; how much does he still owe?

Ans. £3 3*s*. 1½*d*.

30. A farmer has a farm consisting of 200 acres. He gave his eldest son 109 A. 3 R. 20 sq. P.; to his second son, 48 A. 1 R.; the remainder he gave to his third son. What was the remainder?

Ans. 41 A. 3 R. 20 sq. P.

31. In the previous sum how much more did the eldest receive than the third son? Ans. 68 A.

32. What is the length of time between January 16th, 1812, and February 11th, 1840?

Ans. 28 yr. 25 da.

33. What is the difference in time between August 13th, 1750, and January 16th, 1841?
Ans. 90 yr. 5 mo. 3 da.

34. How long is it from July 1st, 1832, to March 17th, 1853? Ans. 20 yr. 8 mo. 16 da.

35. How long is it from June 21st, 1811, to December 14th, 1815? Ans 4 yr. 5 mo. 23 da.

36. The latitude of New York is 40° 42′ 40″, of Quebec 46° 50′ 10″; how many degrees is Quebec north of New York? Ans. 6° 7′ 30″.

37. The latitude of Boston is 42° 21′ 22″; how far is Boston from the North Pole? Ans. 47° 38′ 38″.

38. A merchant bought 3 pieces of cloth; the first measured 47 yd. 3 qr. 1 na.; the second, 43 yd.; the third 41 yd. 3 qr. 3 na.; when he came to examine it, he found 13 yd. 3. na. worthless; how much good cloth was there? Ans. 119 yd. 2 qr. 1 na.

39. From 16 deg. 69 m. 3 fur., take 15 deg. 69 m. 6 fur. 12 p. Ans. 69 m. 0 fur. 28 p.

40. Out of a hhd. of tobacco weighing 13 cwt. 3 qr., there were sold 8 cwt. 2 qr. 11 lb.; how much was left?
Ans. 5 cwt. 0 qr. 14 lbs.

41. What was the value of the remainder at 9 cts. per pound? Ans. $46.26.

MULTIPLICATION.

Art. 93. To Multiply Denominate Numbers,

Rule.—*Place the multiplier under the lowest denomination and multiply it by the multiplier; reduce the product t the next higher denomination, and carry the quotient to th product of the next higher denomination by the same multiplier; procẽed in like manner to the highest denomination, when the whole product must be set down.*

1. Multiply £17 18*s*. 6*d*. by 7. Ans. 125 9*s*. 6*d*.
2. Multiply £296 13*s*. 9¼*d*. by 12.
Ans. 3560 5*s*. 3*d*.

3. Multiply 38 lb. 6 oz. 17 dwt. by 17.
Ans. 655 lb. 8 oz. 9 dwt.
4. Multiply 19 T. 13 cwt. 2 qr. 18 lb. by 19.
Ans. 373 T. 19 cwt. 3 qr. 17 lb.
5. Multiply 3 lb. 4 ℥ 2 ʒ 1 ℈ 17 gr. by 11.
Ans. 36 lb. 11 ℥ 4 ʒ 2 ℈ 7 gr.
6. Multiply 61 E. Fr. 5 qr. 1 na. by 8.
Ans. 495 E. Fr.
7. Multiply 15 yd. 1 ft. 11 in. by 21.
Ans. 328 yd. 1 ft. 3 in.
8. Multiply 17 m. 2 rd. 16 feet. by 23.
Ans. 391 m. 1 fur. 28 rd. 5 ft.
9. Multiply 15 rd. 2 yd. 1 ft. by 29.
Ans. 447 rd. 1 yd. 2 ft.
10. Multiply 144 A. 3 R. 17 sq. p. 19 sq. yd. by 5.
Ans. 724 A. 1 R. 8 sq. p. $4\frac{1}{4}$ sq. yd.
11. Multiply 17 C. 59 cu. ft. 718 cu. in. by 13.
Ans.
12. Multiply 73 hhd. 61 gal. 3 qt. 1 pt. by 26.
Ans.
13. Multiply 14 bu. 3 pk. 4 qt. by 37.
Ans.
14. Multiply 38 cent. 19 yr. 360 da. by 14., $365\frac{1}{4}$ days to the year. Ans. 534 cent. 79 yr. $291\frac{3}{4}$ da.
15. Multiply 18° 40′ 41″ by 53. Ans.
16. Multiply 18 bu. 3 pk. 5 qt. by 72.
Ans.
17. Multiply £114 11*s.* $2\frac{1}{2}$*d.* by 36.
Ans.
18. Multiply 4 deg. 17 m. 5 fur. by 36.
Ans.
19. Multiply 49 yd. 1 ft. 11 in. by 29.
Ans.
20. Multiply 18 bbl. 20 gallon 2 qt. by 37.
Ans.
21. Multiply 17 w. 4 da. 11 hr. 16 min. by 131.
Ans.
22. Multiply 1 A. 0 R. 11 sq. p. by 149.
Ans.

23. Multiply 39 cwt. 3 qr. 15 lb. 2 oz. 13 dr. by 47
Ans.

24. Multiply £7 18*s.* 6*d.* by 389.
Ans.

25. Multiply 15 lb. 7 ℥ 3 ʒ by 673.
Ans.

26. Multiply 22 lb. 8 oz. 13 dwt. 21 gr. by 981.
Ans.

27. Multiply $47.29 by 711, according to this rule
Ans.

28. Multiply 17 gal. 2 qt. 1 pt. 3 gi. by 819.
Ans.

When the value of a single article is known, how can the value of any number of articles of the same kind be found? (Art. 34.)

When it is known what can be bought for 1 dollar or 1 pound, how is the quantity that can be bought for any number of dollars or pounds found?

Multiply the quantity that can be bought for one dollar or pound by the number of dollars or pounds.

29. If one cord of wood cost £1 16*s.* 9½*d.*, what will 25 cords cost?
Ans. £45 19*s.* 9½*d.*

30. If you can buy 3 bu. 2 pk. 3 qt. for one dollar, how many bushels can be bought for $79?
Ans. 283 bu. 3 pk. 5 qt.

31. Bought 17 yards of lace, at £3 17*s.* 1*d* per yard; 14 yards of crape, at £2 10*s.* per yard. What is the value of both purchases?
Ans. £100 10*s.* 5d.

32. If you buy 13 yd. 3 qr. 2 na. for £1, how many yards can be bought for £38?
Ans. 527 yd. 1 qr.

33. If you can exchange one acre of wheat for 17 A. 3 R. 7 sq. p. of pasture, how many acres of pasture can you get for 41 acres of wheat? Ans. 729 A. 2 R. 7 sq. p.

34. Bought 16 pieces of lace, each containing 62 yd., at £1 11*s.* 2*d.* per yd., and sold 7 pieces for £1 15*s.* per yd., and the rest at £1 13*s.* 10*d.* per yd.; how much was gained? Ans. £157 11*s.* 8*d.*

35. Bought the following bill of goods:

			s.	*d.*	
20	lb. Butter	at	2	9	*per lb.*
10	lb. Cheese	"	1	3½	"
100	lb. Sugar	"		9	"
30	lb. Tea	"	7	8	"

What is the total amount?

Ans. £18 12*s.* 11*d.*

(36.)

Bought of SHEPHERD, & Co.,

			£.	*s.*	*d.*	
46	Barrels of Pork	at	2	13	3	*per barrel.*
49	" " Beef	"	2	13	4	" "
144	" " Flour	"	3	15	9	" "
56	" " Fish	"	1	11	11	" "
197	" " Apples	"	2	16	5	" "

What is the total amount?

Ans. £1443 12*s.* 3*d.*

(37.)

New York, April 17, 1853.

Bought of JONES & Co.,

			s.	*d.*	
38	Axes - - - -	"	3	6	*each.*
14	Doz. Hooks -	"	3	0	*per doz.*
129	Hoes - - - -	"	1	6	*each.*
245	lb. Nails - - -	"		7	*lb.*
68	Hammers - -	"	3	2	*each.*
75	Screw-drivers -	"	1	10	"
16	Gross of Screws	"	14	5½	*per gross.*
27	Pick-axes - -	"	13	8	*each.*

What is the amount of the bill?

Ans.

DIVISION.

ART. 94. To Divide Denominate Numbers,

RULE.—*Divide the divisor into the highest denomination of the dividend, and set the quotient under that denomina-*

tion; reduce the remainder to the next lower denomination and add in as many as there are of that denomination, and divide the sum by the divisor, set down the quotient and proceed with the remainder as before; if there should be no remainder, divide the divisor into the next lower denomination.

1. Divide £91 12*s*. 6*d*. by 6. Ans. £15 5*s*. 5*d*.
2. Divide £168 19*s*. $2\frac{3}{4}$*d*. by 19.
Ans. £8 17*s*. $10\frac{1}{4}$*d*.
3. Divide 386 lb. 0 oz. 16 dwt. 23 gr. by 29.
Ans. 13 lb. 3 oz. 15 dwt. $1\frac{18}{29}$.
4. Divide 9 tons 16 cwt. 2 qr. 16 lb. 3 oz. 4 dr. by 17. Ans. 11 cwt. 2 qr. 6 lb. 13 oz. $5\frac{15}{17}$ dr.
5. Divide 61 lb, 10 ℥, 4 ʒ, 0 ℈, 16 gr. by 36.
Ans. 1 lb. 8 ℥, 5 ʒ, 0 ℈, $0\frac{16}{36}$ gr.
6. Divide 129 E.E. 4 qr. 1 na. 2 in. by 63.
Ans. 2 E.E. 0 qr. 1 na. +
7. Divide 78 m. 3 fur. 14 p. by 31.
Ans. 2 m. 4. fur. 9 p. $\frac{15}{31}$.
8. Divide 4 yd. 1 ft. 11 in. by 15.
Ans. 0 yd. 0 ft. $11\frac{2}{15}$ in.
9. Divide 1986 m. 3 fur. 20 p. 1 yd. by 108.
Ans. 18 m. 3 fur. 5 p. $4\frac{9}{108}$ yd.
10. Divide 86 deg. 60 m. 3 fur. 19 p. by 121.
Ans. 49 m. 7. fur. $6\frac{93}{121}$ p.
11. Divide 224 A. 3 R. 17 sq. p. by 22.
Ans. 10 A. 0 R. 35 $\frac{7}{22}$ sq. p.
12. Divide 284 sq. yd. 8 sq. ft. 120 sq. in. by 79.
Ans. 3 sq. yd. 5 sq ft. 67 $\frac{11}{79}$ sq. in.
13. Divide 19861 sq. m. 179 A. 3 R. 20 sq. p. 11 sq. yd. by 61.
Ans. 325 sq. m. 380 A. 2 R. 24 sq. p. $18\frac{2}{61}$ sq. yd.
14. Divide 738 cu. yd. 20 cu. ft. 1100 cu. in. by 399.
Ans. 1 cu. yd. 22 cu. ft. $1713\frac{173}{399}$ cu. in.
15. Divide 158 cords, 111 sol. ft. 1250 sol. in. by 310. Ans. 65 cu. feet, 1035 $\frac{80}{310}$ cu. in.
16. Divide 20 hhd. 16 gal. 3 qt. 1 gi. by 147.
Ans. 8 gal. 2 qt. 1 pt. $1\frac{138}{147}$ gi

17. Divide 175 bu. 3 pk. 1 qt. 1 pt. by 67.
Ans. 2 bu. 2 pk. 3 qt. $1\frac{62}{67}$ pt.

18. Divide 1 circle by 128. 2° 48′ 45″.

19. Divide 365 da. 6 hr. by 240.
Ans. 1 da. 12 hr. 31 min. 30 sec.

When the value of a single article and the value of a number of articles are known, how can the number of articles be found? (Art. 54.)

When the number of articles and their value are known, how can the value of a single article be found? (Art. 53.)

20. If 16 bushels of oysters cost £75 17*s.* 4*d.*, what will one bushel cost? Ans. £4 14*s.* 10*d.*

21. If 24 barrels of apples cost £98 16*s.*, how much will one barrel cost? Ans. £4 2*s.* 4*d.*

22. If 200 acres of land cost £13390, what will one acre cost? Ans. £66 19*s.*

23. If you can buy 359 bu. 1 pk. 4 qt. of apples for £100, how many bushels can you buy for one pound?
Ans. 3 bu. 2 pk. 3 qt.

24. If one yard cost 2*s.* 6*d.*, how many yards can be bought for £180? Ans. 1440 yd.

25. If you can buy 15 sq. rods of land for £1, for how many pounds can you buy one acre?
Ans. £10 13*s.* 4d.

26. Divide a square mile into 15 equal parts.
Ans. 42 A. 2 R. 26 sq. p. 20 sq. yd. 1 sq. ft. 72 sq. in.

27. A man travelled 1249 m. 5 fur. 36 rod in 61 days; how far did he travel in a day?
Ans. 20 m. 3 fur. 36 rd.

28. A cartman carried 117 cords, 110 cu. ft. in 100 loads; how much did he average a load?
Ans. 1 C. 22 cu. ft. 1486 $\frac{8}{100}$ cu. in.

29. A tailor had two pieces of cloth; one was 29 yd. 3 qr. long, and the other 31 yd. 1 qr. 1 na. long; he made 3 coats out of the first piece, and one out of the second; it took 3 yd. 2 qr. to make each coat; how many yards of cloth had he left out of the two pieces?
Ans. 47 yd. 0 qr. 1 na.

30. A man bought 6 pieces of cloth, each piece 34 yd.

2 qr.; afterwards he bought 11 pieces, each 35 yd. 1 qr. 3 na.; he sold 296 yd. 2 qr. out of the whole; how much had he left? Ans. 300 yd. 1 qr. 1 na.

31. A person had £1000; he had two sons and three daughters; he gave each son £280 3*s.* 9*d.*, and divided the remainder equally among the daughters. How much did each daughter get?

Ans. £146 10*s.* 10d.

32. A gentleman owns 3 farms; the first contains 49 A. 3 R. 18 sq. p.; the second, 94 A. 1 R. 28 sq. p., and the third 146 A. 34 sq. p. He divided it into 20 equal portions, 8 of which he kept for himself, and the rest he divided equally between his 4 children; how much did each child receive? Ans. 43 A. 2 R. 12 sq. p.

33. There are 2 men, who have 179 A. 3 R. 16 sq. p. divided equally between them; the first divides his share equally between his 3 children, and the second divides his equally between his 2 children; how much does a child of each receive?

Ans. { 29 A. 3 R. 36 sq. p. for a child of 1st.
44 A. 3 R. 34 sq. p. " " 2d.

34. If 3 yards of cloth cost £4 16*s.* 6*d.*, how much will 12 yds. cost? Ans. £19 6*s.*

35. If 16 acres of land be worth £260 10*s.* 8*d.*, how much will 30 acres cost? Ans. £488 10*s.*

36. If 13 cwt. of sugar cost £54 18*s.* 6d., what will 4 cwt. cost? Ans. £16 18*s.*

37. If 39 head of cattle cost £1891 10*s.*, what will 17 cost? Ans. £824 10*s.*

38. If 75 barrels of flour cost £164 10*s.* 7½*d.*, what will 30 barrels cost? Ans. £65 16*s.* 3*d.*

39. If the cost of transporting a block of marble 7 miles is £3 5*s.* 4d., how much would it cost for 3 miles?

Ans. £1 8*s.*

40. If 47 yards of velvet cost £156 18*s.* 2¾*d.* what will 100 yards cost? Ans. £333 17*s.* 1*d.*

41. A person at his death left a house worth £1191 2*s.* 9*d*; 2 farms worth £1726 each; furniture worth £629 11*s.*, and money to the value of £2860 18*s.* 9d.,

which was equally divided among his 5 sons; what was the share of each son? Ans. £1626 14s. 6d.

42. If 767 A. 2 R. be equally divided between 100 men, how much will 54 of them get.

Ans. 414 A. 1 R. 32 sq. p.

43. If 7 gross of buttons cost £2. 16*s.*, how much will 100 gross cost? Ans. £40.

44. A brewer sold 9 hhd. of beer, each of which contained 53 gal. 2 qt. 1 pt.; 18 gal. leaked out of the whole; he sold another lot of 16 hhd., each containing 54 gal. 1 qt., out of which there leaked 21 gal. 1 qt., how much remained out of both sales?

Ans. 1311 gal. 1 qt. 1 pt.

45. A person travelling at the same rate every day, goes 175 m. 3 fur. 25 p. in 5 days; how far does he go in 37 days? Ans. 1298 m. 2 fur. 33 rd.

46. If a quantity of provisions will last 64 men for 3 wk. 5 da., how long will it last one man? 8 men?

Ans. 29 wk. 5 da.

47. A man left property to the amount of £1718 9*s.* 6*d.*; he divided this into 2 equal parts, one of which he gave to his wife, and the other part was divided equally between his 3 daughters; how much did each daughter get, and the wife?

Ans. { £859 4*s.* 9*d.*, for wife.
£286 8*s.* 3*d.* for each daughter.

48. At the beginning of the year 1852, a grocer laid in 17 hhd. of sugar, each weighing 11 cwt. 2 qr. 15 lb.; 7 casks of cheese, each cask weighing 19 cwt. 1 qr. 12 lb.; 40 chests of tea, each weighing 60 lb. He took an account of stock at the beginning of 1853, and found on hand 126 cwt 3 qr. 14 lb. of sugar, 98 cwt. 1 qr. of cheese, 32 chests and 28 lb. of tea; how much sugar, cheese, and tea had he sold?

Ans. { 71 cwt. 0 qr. 16 lb. of sugar.
37 cwt. 1 qr. 9 lb. of cheese.
452 lb. tea.

INTRODUCTION TO FRACTIONS.

Art. 95. What is a Common Divisor of two or more Numbers?

It is a number which will divide them all without a remainder.

Art. 96. What is the *greatest* Common Divisor of two or more Numbers?

It is the greatest number that will divide each of them without a remainder.

Art. 97. To find the greatest Common Divisor of two Numbers,

Rule.—*Divide the less number into the greater; if there be a remainder, divide it into the previous divisor, and so proceed until there is no remainder; the last divisor will be the greatest common divisor of the two numbers.*

1. Find the greatest common divisor of 126 and 729.
Ans. 9.
2. Find the greatest common divisor of 144 and 729.
Ans. 9.
3. Find the greatest common divisor of 720 and 1296.
Ans. 144.
4. Find the greatest common divisor of 225 and 1260.
Ans. 45.
5. Find the greatest common divisor of 432 and 1728.
Ans. 432.
6. What is the greatest common divisor of 3136 and 4096? Ans. 64.
7. What is the greatest common divisor of 457 and 831? Ans. 1.
8. What is the greatest common divisor of 444 and 777? Ans. 111.

Art. 98. To Find the greatest Common Divisor of *more* than two Numbers,

Rule.—*Find the greatest common divisor of two of them; then take this common divisor and another of the given numbers and find their greatest common divisor; the last divisor will be the greatest common divisor of the three numbers; if there be more, proceed in the same way.*

9. Find the greatest common divisor of 720, 1296, and 1944. Ans. 72.

10. What is the greatest common divisor of 525, 625, and 700? Ans. 25.

11. What is the greatest common divisor of 360, 648, and 972? Ans. 36.

12. What is the greatest common divisor of 56, 140, and 182? Ans. 14.

13. What is the greatest common divisor of 175, 245, and 343? Ans. 7.

14. Find the greatest common divisor of 576, 864, 1028, and 1296. Ans. 4.

15. What is the greatest common divisor of 512, 1280, 1920, 2720, and 3440? Ans. 16.

16. What is the greatest divisor of 198, 343, and 1716? Ans. 1.

Art. 99. What is the Common Dividend or Multiple of two or more Numbers?

It is a number which can be divided by all the given numbers without a remainder.

Art. 100. What is the *least* Common Dividend or Multiple of several Numbers?

It is the least number into which all the given numbers can be divided without a remainder.

Art. 101. To find the least Common Dividend of several Numbers,

Rule.—*Arrange the given numbers in a horizontal row;*

reject those numbers that are exact divisors of any one of the others, then divide the numbers not rejected by any prime number that will exactly divide two or more of them, bringing down those that cannot be divided exactly, in the same line with the quotients; then reject any of these numbers that are exact divisors of another, and divide the numbers not rejected as before, and so proceed until no prime number will divide two or more of the numbers in the last row; the product of the numbers in this row and of all the divisors will be the least common dividend of the given numbers; or,

Separate each number into its prime factors, and reject all the common factors except one; the product of the factors not rejected, will be the least common dividend.

NOTE.—If the numbers are prime, their product will be the least common dividend.

17. Find the least common dividend of 4, 8, 12, 16, 20.
Ans. 240.

18. Find the least common dividend of 5, 15, 24, 27, 40.
Ans. 1080.

19. What is the dividend of 8, 10, 15, and 18?
Ans. 360.

20. What is the common dividend of 4, 12, 16, and 19?
Ans. 912.

21. What is the least common dividend of 3, 6, 9, 12, 15, and 18?
Ans. 180.

22. What is the least common dividendof 2, 4, 7, 6, 8, and 10?
Ans. 840.

23. What is the least common dividend of 9, 11, 13, 15, and 17?
Ans. 109395.

24. Find the least common dividend of 7, 14, 16, 21, and 24.
Ans. 336.

25. Find the least common dividend of 6, 11, 18, 33 and 36.
Ans. 396.

26. Find the least common dividend of 2, 5, 7, 9, 11 and 15.
Ans. 6930.

27. Find the least common dividend of 9, 18, 27, 36, 45, and 54.
Ans. 540.

28. Find the least common dividend of 2, 3, 5, 7, and 11. Ans. 2310.

29. What is the least common dividend of 4, 5, 8, and 9? Ans. 360.

30. What is the least common dividend of 2, 3, 4, 8, 11, and 16? Ans. 528.

31. What is the least common dividend of 2, 5, 13, 16, and 19? Ans. 19760.

32. What is the least common dividend of 4, 10, 14, 15, and 21? Ans. 420.

FRACTIONS.

Art. 102. What is a Fraction?

A Fraction is one or more of the equal parts into which a whole number may be divided.

Art. 103. How many classes of Fractions are there?

Two; Common and Decimal Fractions.

Art. 104. What is a Vulgar Fraction?

A Vulgar Fraction is one that is expressed by two numbers written one above the other with a horizontal line between them.

Art. 105. What is the upper number called?

The numerator.

Art. 106. What is the lower number called?

The denominator.

Art. 107. What does the denominator express?

The denominator expresses into how many equal parts a unit is divided.

Art. 108. What does the numerator express?

The numerator expresses how many of those equal parts are to be used.

Note.—The numerator and denominator taken together are called the terms of a fraction.

Art. 109. How many kinds of Fractions are there?

Six:—Proper, improper, mixed numbers, simple, compound, and complex.

Art. 110. What is a Proper Fraction?

It is a fraction whose numerator is less than its denominator.

Art. 111. What is an Improper Fraction?

It is a fraction whose numerator is equal to, or greater than its denominator.

Art. 112. What is a Mixed Number?

It is composed of a whole number and a fraction.

Art. 113. What is a Simple Fraction?

It is a fraction whose numerator and denominator are whole numbers.

Art. 114. What is a Compound Fraction?

It is a fraction of a fraction, or several simple fractions joined by the word "of."

Art. 115. What is a Complex Fraction?

It is a fraction that has a fraction in the numerator or denominator, or in both.

Art. 116. What alteration is made in the *value* of a fraction by dividing or multiplying both terms by the same number?

No alteration.

Art. 117. What is altered?

The form of the fraction only is altered.

Art. 118. Why does the division or multiplication of both terms of a fraction by the same number make no alteration in value?

Because the value of a fraction does not depend singly upon the numerator, or upon the denominator, but upon the relation that one holds to the other.

REDUCTION.

119. To reduce a fraction to its lowest terms.

Rule.—*Divide both terms by their greatest common divisor, or by their common factors.*

1. Reduce $\frac{24}{36}$ to its lowest terms. Ans. $\frac{2}{3}$.
2. Reduce $\frac{13}{26}$ to its lowest terms. Ans. $\frac{1}{2}$.
3. Reduce $\frac{16}{30}$ to its lowest terms. Ans. $\frac{8}{15}$.
4. Reduce $\frac{28}{40}$ to its lowest terms. Ans. $\frac{7}{10}$.
5. Reduce $\frac{36}{54}$ to its lowest terms. Ans. $\frac{2}{3}$.
6. Reduce $\frac{22}{77}$ to its lowest terms. Ans. $\frac{2}{7}$.
7. Reduce $\frac{34}{85}$ to its lowest terms. Ans. $\frac{2}{5}$.
8. Reduce $\frac{96}{128}$ to its lowest terms. Ans. $\frac{3}{4}$.
9. Reduce $\frac{104}{130}$ to its lowest terms. Ans. $\frac{4}{5}$.
10. Reduce $\frac{156}{195}$ to its lowest terms. Ans. $\frac{4}{5}$.
11. Reduce $\frac{256}{576}$ to its lowest terms. Ans. $\frac{4}{9}$.
12. Reduce $\frac{320}{1080}$ to its lowest terms. Ans. $\frac{8}{27}$.
13. Reduce $\frac{718}{1850}$ to its lowest terms. Ans. $\frac{359}{925}$.
14. Reduce $\frac{512}{676}$ to its lowest terms. Ans. $\frac{128}{169}$.
15. Reduce $\frac{3060}{16500}$ to its lowest terms. Ans. $\frac{51}{275}$.
16. Reduce $\frac{17550}{56160}$ to its lowest terms. Ans. $\frac{5}{16}$.
17. Reduce $\frac{14455}{35931}$ to its lowest terms. Ans. $\frac{35}{87}$.

Art. **120.** To reduce Improper Fractions to whole or mixed numbers,

Rule.—*Divide the numerator of the fraction by the denominator, and if there be a remainder place it above the divisor in the form of a fraction, and annex it reduced to its lowest terms to the whole number in the quotient.*

18. Reduce $\frac{27}{9}$ to a whole number. Ans. 3.
19. Reduce $\frac{312}{24}$ to a whole number. Ans. 13.
20. Reduce $\frac{1700}{45}$ to a mixed number. Ans. $37\frac{7}{\text{[illegible]}}$.

21. Reduce $\frac{4186}{250}$ to a mixed number. Ans. $16\frac{93}{125}$.

22. Reduce $\frac{11700}{360}$ to a mixed number. Ans. $32\frac{1}{2}$.

23. Reduce $\frac{43611}{770}$ to a mixed number.
Ans. $56\frac{491}{770}$.

24. Reduce $\frac{13420}{300}$ to a mixed number.
Ans. $44\frac{11}{15}$.

25. Reduce $\frac{4666}{231}$ to a mixed number. Ans. $20\frac{46}{231}$.

26. Reduce $\frac{5416}{39}$ to a mixed number. Ans. $138\frac{34}{39}$.

27. Reduce $\frac{59150}{175}$ to a whole number. Ans. 338.

28. Reduce $\frac{77112}{980}$ to a mixed number. Ans. $78\frac{24}{35}$.

29. Reduce $\frac{83001}{1692}$ to a mixed number.
Ans. $49\frac{31}{564}$.

30. Reduce $\frac{40000}{375}$ to a mixed number. Ans. $106\frac{2}{3}$.

31. Reduce $\frac{71883}{4000}$ to a mixed number.
Ans. $17\frac{3883}{4000}$

32. Reduce $\frac{60021}{1070}$ to a mixed number.
Ans. $56\frac{101}{1070}$.

Art. 122. To reduce a whole or mixed number to an improper fraction,

Rule.—*If the number be whole, multiply it by the number required for a denominator and place the product over it;*

If the number be mixed, multiply the whole number by the denominator of the fraction, to the product add the numerator, and place the sum over the denominator.

Art. 123. What is the simplest form of reducing a whole number to the form of a fraction?

Place a unit under it.

33. Reduce $17\frac{1}{2}$ to an improper fraction. Ans $\frac{35}{2}$.

34. Reduce $47\frac{3}{4}$ to an improper fraction
Ans. $\frac{191}{4}$.

35. Reduce $68\frac{7}{8}$ to an improper fraction.
Ans. $\frac{551}{8}$.

36. Reduce 18 to fifths. Ans. $\frac{90}{5}$.

37. Reduce 95 to sevenths. Ans. $\frac{665}{7}$.

38. Reduce $75\frac{5}{9}$ to an improper fraction.
Ans. $\frac{680}{9}$.

39. Reduce $45\frac{11}{12}$ to an improper fraction.
Ans. $\frac{551}{12}$.

40. Reduce 321 to fifteenths. Ans. $\frac{4815}{15}$.

41. Reduce 171 to thirty-thirds. Ans. $\frac{5643}{33}$.

42. Reduce $496\frac{14}{17}$ to an improper fraction.
Ans. $\frac{8446}{17}$.

43. Reduce $729\frac{4}{25}$ to an improper fraction.
Ans. $\frac{18229}{25}$.

44. Reduce $4633\frac{17}{18}$ to an improper fraction.
Ans. $\frac{83411}{18}$.

45. Reduce $1654\frac{37}{300}$ to an improper fraction.
Ans. $\frac{496237}{300}$.

46. Reduce $4375\frac{14}{31}$ to an improper fraction.
Ans. $\frac{135639}{31}$.

47. Reduce $7300\frac{5}{41}$ to an improper fraction.
Ans. $\frac{299305}{41}$.

48. Reduce $34\frac{77}{3600}$ to an improper fraction.
Ans. $\frac{122477}{3600}$.

49. Reduce $75\frac{47}{90}$ to an improper fraction.
Ans. $\frac{6797}{90}$.

50. Reduce 4800 to seventy fifths. Ans. $\frac{360000}{75}$.

51. Reduce 147 to a fraction whose denominator shall be 46. Ans. $\frac{6762}{46}$.

52. Reduce 6875 to a fraction whose denominator shall be 360. Ans. $\frac{2475000}{360}$.

Art. 124. To reduce compound fractions to simple ones,

Rule.—*If the fractions that compose the compound fractions are simple, cancel all the factors common to numerators and denominators, and then multiply the remaining numerators together for a numerator, and the remaining denominators for a denominator. If the proposed fraction contain mixed numbers, reduce them to improper fractions, and proceed as before.*

53. Reduce $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{8}{17}$ to a simple fraction.
Ans. $\frac{1}{17}$.

54. Reduce $\frac{2}{3}$ of $\frac{5}{8}$ of $\frac{6}{7}$ to a simple fraction.
Ans. $\frac{5}{14}$.

55. Reduce $\frac{4}{5}$ of $\frac{7}{12}$ of $\frac{18}{25}$ to a simple fraction.
Ans. $\frac{42}{125}$.

56. Reduce $\frac{5}{9}$ of $\frac{6}{7}$ of $\frac{3}{4}$ of $\frac{19}{20}$ to a simple fraction.
Ans. $\frac{19}{56}$.

57. Reduce $\frac{17}{21}$ of $\frac{7}{8}$ of $\frac{9}{10}$ of $\frac{4}{11}$ of $\frac{12}{25}$ to a simple fraction.
Ans. $\frac{153}{1375}$.

58. Reduce $\frac{4}{5}$ of $\frac{16}{17}$ of $\frac{3}{4}$ of $\frac{17}{18}$ to a simple fraction.
Ans. $\frac{8}{15}$.

59. Reduce $\frac{9}{10}$ of $\frac{9}{100}$ of $\frac{5}{21}$ of $\frac{5}{27}$ to a simple fraction.
Ans. $\frac{1}{280}$.

60. Reduce $\frac{2}{3}$ of $3\frac{1}{2}$ of 250 to a simple fraction.
Ans. $583\frac{1}{3}$.

61. Reduce $\frac{4}{5}$ of $3\frac{3}{4}$ of $2\frac{1}{4}$ to a simple fraction.
Ans. $6\frac{3}{4}$.

62. Reduce $\frac{7}{8}$ of $\frac{7}{9}$ of $2\frac{2}{3}$ of $6\frac{3}{7}$ to a simple fraction.
$11\frac{2}{3}$.

63. Reduce $3\frac{3}{4}$ of $\frac{1}{15}$ of $\frac{11}{12}$ of $4\frac{1}{2}$ to a simple fraction.
Ans. $1\frac{1}{32}$.

64. Reduce $\frac{7}{18}$ of $6\frac{3}{4}$ of $\frac{18}{25}$ of $\frac{9}{17}$ of $77\frac{1}{2}$ to a simple fraction.
Ans. $77\frac{371}{680}$.

65. Reduce $\frac{11}{12}$ of $16\frac{1}{2}$ of $7\frac{7}{11}$ of $18\frac{3}{4}$ to a simple fraction.
Ans. $2165\frac{5}{8}$.

66. Reduce $\frac{9}{29}$ of $\frac{11}{12}$ of $4\frac{5}{6}$ of $16\frac{1}{2}$ of 2 to a simple fraction.
Ans. $45\frac{3}{8}$.

Art. 125. To reduce complex fractions to simple fractions,

Rule.—*If the numerator and denominator be simple fractions, invert the denominator, place the numerator after it, with the word "of" between, and proceed as in compound fractions; if there be mixed numbers in the numerator or denominator, reduce them to improper fractions, and proceed as before.*

67. Reduce $\frac{\frac{2}{3}}{\frac{4}{5}}$ to a simple fraction. Ans. $\frac{5}{6}$.

68. Reduce $\frac{\frac{7}{8}}{\frac{9}{16}}$ to the simplest form. Ans. $1\frac{5}{9}$.

69. Reduce $\frac{\frac{5}{6}}{\frac{15}{16}}$ to a simple fraction. Ans. $\frac{8}{9}$.

70, Reduce $\frac{\frac{15}{22}}{\frac{13}{33}}$ to the simplest form. Ans. $1\frac{19}{26}$.

71. Reduce $\frac{\frac{7}{8}}{\frac{11}{15}}$ to the simplest form. Ans. $1\frac{17}{88}$.

72. Reduce $\frac{\frac{1}{2}}{3\frac{3}{4}}$ to simple fraction. Ans. $\frac{2}{15}$.

73. Reduce $\frac{\frac{3}{5}}{\frac{7}{8}}$ to a simple fraction. Ans. $\frac{24}{35}$.

74. Reduce $\frac{\frac{4}{7}}{13\frac{1}{4}}$ to a simple fraction. Ans. $\frac{16}{371}$.

75. Reduce $\frac{\frac{5}{8}}{\frac{14}{15}}$ to a simple fraction. Ans. $\frac{75}{112}$.

76. Reduce $\frac{\frac{7}{12}}{19\frac{1}{2}}$ to a simple fraction. Ans. $\frac{7}{234}$.

77. Reduce $\frac{13\frac{1}{3}}{50}$ to a simple fraction. Ans. $\frac{4}{15}$.

78. Reduce $\frac{3\frac{1}{2}}{63}$ to a simple fraction. Ans. $\frac{1}{18}$.

79. Reduce $\frac{66\frac{2}{3}}{100}$ to a simple fraction. Ans. $\frac{2}{3}$.

80. Reduce $\frac{87\frac{1}{2}}{100}$ to a simple fraction. Ans. $\frac{7}{8}$.

81. Reduce $\frac{43\frac{3}{4}}{100}$ to a simple fraction. Ans. $\frac{7}{16}$.

82. Reduce $\frac{93\frac{3}{4}}{100}$ to a simple fraction. Ans. $\frac{15}{16}$

83. Reduce $\frac{68\frac{3}{4}}{100}$ to a simple fraction. Ans. $\frac{11}{16}$.

84. Reduce $\frac{4}{4\frac{1}{2}}$ to a simple fraction. Ans. $\frac{8}{9}$.

85. Reduce $\frac{33\frac{1}{3}}{66\frac{2}{3}}$ to a simple fraction. Ans. $\frac{1}{2}$

86. Reduce $\frac{15\frac{7}{8}}{31\frac{3}{4}}$ to a simple fraction. Ans. $\frac{1}{2}$.

87. Reduce $\frac{99\frac{11}{13}}{1098\frac{4}{13}}$ to a simple fraction. Ans. $\frac{1}{11}$.

88. Reduce $\frac{77\frac{1}{2}}{188\frac{2}{3}}$ to a simple fraction. Ans. $\frac{465}{1132}$.

89. Reduce $\frac{151\frac{1}{4}}{191\frac{2}{15}}$ to a simple fraction. Ans. $\frac{9075}{11468}$.

90. Reduce $\frac{15}{44\frac{7}{8}}$ to a simple fraction. Ans. $\frac{120}{359}$.

91. Reduce $\frac{155\frac{4}{7}}{1111\frac{2}{3}}$ to a simple fraction. Ans. $\frac{3267}{23345}$.

Art. 126. To reduce compound fractions that contain complex fractions, to simple ones,

Rule.—*Reduce the complex fractions to the simple ones, and proceed as in the reduction of compound fractions.*

92. Reduce $\frac{7}{8}$ of $\frac{5\frac{1}{2}}{6}$ of $\frac{6\frac{7}{8}}{11}$ to a simple fraction.

Ans. $\frac{385}{768}$.

93. Reduce $2\frac{1}{2}$ of $19\frac{1}{3}$ of $\frac{3\frac{1}{2}}{7}$ to the simplest form.

Ans. $24\frac{1}{6}$.

94. Reduce $\frac{4\frac{1}{2}}{7}$ of $\frac{2}{2\frac{3}{4}}$ of $\frac{\frac{1}{2}}{1\frac{1}{4}}$ to a simple fraction.

Ans. $\frac{72}{385}$.

95. Reduce $\frac{13}{16}$ of $\frac{2\frac{1}{3}}{18\frac{2}{3}}$ of $10\frac{1}{3}$ to the simplest form.

Ans. $1\frac{24}{103}$.

96. Reduce $\frac{\frac{2}{3}}{\frac{7}{8}}$ of $\frac{\frac{3}{4}}{12}$ of $16\frac{1}{2}$ to a simple fraction.

Ans. $\frac{11}{14}$.

97. Reduce $\frac{\frac{1}{3}}{\frac{4}{5}}$ of $\frac{3\frac{1}{4}}{5}$ of 29 to the simplest form.

Ans. $7\frac{41}{48}$.

98. Reduce $\frac{37\frac{1}{2}}{50}$ of $\frac{44\frac{2}{3}}{57}$ of 19 to the simplest form.

Ans. $11\frac{1}{6}$.

99. Reduce $14\frac{1}{2}$ of $\frac{3}{7\frac{1}{4}}$ of $\frac{\frac{7}{8}}{\frac{11}{12}}$ to the simplest form.

Ans. $5\frac{8}{11}$.

100. Reduce $\frac{17\frac{1}{2}}{70}$ of $\frac{11}{18\frac{6}{7}}$ of $\frac{9\frac{1}{2}}{10}$ to a simple fraction.

Ans. $\frac{133}{960}$.

101 Reduce $\frac{1}{20\frac{1}{2}}$ of $\frac{5\frac{1}{8}}{7}$ of $99\frac{1}{4}$ to the simplest form.

Ans. $3\frac{61}{112}$.

ART. 127. What is the Common Denominator of several fractions?

It is the common dividend or multiple of their denominators.

ART. 128. To find the *least* common denominator of several fractions,

RULE.—*Find the least common dividend or multiple of the denominators.* (Art. 101.)

ART. 129. To reduce fractions to their least common denominator,

RULE.—*Reduce the improper, compound, and complex fractions to their simplest form; find the least common dividend of the denominators; then divide the denominator of each fraction separately into the common denominator, multiply the quotient by the numerator, and place the product over the common denominator; proceed in the same manner with each of the given fractions, and they will be reduced to others having a common denominator.*

102. Reduce $\frac{1}{2}$, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{5}{12}$ to their least common denominator. Ans. $\frac{12}{24}$, $\frac{16}{24}$, $\frac{21}{24}$, $\frac{10}{24}$.

103. Reduce $\frac{5}{8}$, $\frac{2}{5}$, $\frac{3}{4}$, and $\frac{4}{15}$, to their least common denominator. Ans. $\frac{75}{120}$, $\frac{48}{120}$, $\frac{90}{120}$, and $\frac{32}{120}$.

104. Reduce $\frac{3}{10}$, $\frac{1}{3}$, $\frac{5}{6}$, $\frac{2}{7}$ and $\frac{7}{12}$, to their least common denominator. Ans. $\frac{126}{420}$, $\frac{140}{420}$, $\frac{350}{420}$, $\frac{120}{420}$, $\frac{245}{420}$.

105. Reduce $3\frac{1}{2}$, $5\frac{1}{4}$, $7\frac{2}{5}$ and $\frac{3}{8}$, to their least common denominator. Ans. $3\frac{20}{40}$, $5\frac{10}{40}$, $7\frac{16}{40}$, and $\frac{15}{40}$.

106. Reduce $7\frac{5}{9}$, $\frac{4}{15}$ and $1\frac{6}{7}$ to their least common denominator. Ans. $7\frac{175}{315}$, $\frac{84}{315}$, $1\frac{270}{315}$

107. Reduce $\frac{7}{25}$, $8\frac{3}{10}$, and $4\frac{13}{50}$ to their least common denominator. Ans. $\frac{14}{50}$, $8\frac{15}{50}$, and $4\frac{13}{50}$.

108. Reduce $\frac{3}{4}$ of $\frac{2}{15}$, $\frac{5}{14}$ of $3\frac{1}{2}$, and $17\frac{3}{5}$ to their least common denominator. Ans. $\frac{2}{20}$, $1\frac{5}{20}$, $17\frac{12}{20}$.

109. Reduce $\frac{2}{3}$ of $\frac{6}{7}$ of $10\frac{1}{2}$, $\frac{4}{5}$ of $\frac{10}{11}$ of $\frac{11}{12}$ of 2, and $\frac{18}{19}$ to their least common denominator. Ans. 6, $1\frac{19}{57}$, $\frac{54}{57}$.

110. Reduce $\frac{7}{11}$, $\frac{8}{19}$, $\frac{4}{15}$, and $\frac{7}{45}$ to their least common denominator. Ans. $\frac{5985}{9405}$, $\frac{3960}{9405}$, $\frac{2508}{9405}$, $\frac{1463}{9405}$.

111. Reduce $\frac{3}{8}$ of $17\frac{1}{2}$, $\frac{6}{13}$ of $\frac{11}{12}$, $27\frac{1}{5}$ to their least common denominator. Ans. $6\frac{585}{1040}$, $\frac{440}{1040}$, $27\frac{208}{1040}$.

112. Reduce $\frac{5}{7}$ of $2\frac{1}{3}$, $\frac{6}{11}$ of $\frac{2}{3}$, $\frac{4}{5}$ of $\frac{17\frac{1}{2}}{35}$, to their least common denominator. Ans. $1\frac{110}{165}$, $\frac{60}{165}$, $\frac{66}{165}$.

113. Reduce $\frac{11}{12}$, $\frac{6\frac{7}{8}}{20\frac{5}{8}}$, $\frac{6\frac{1}{2}}{26}$, and $\frac{2}{3}$ of $\frac{4\frac{1}{2}}{9}$ to their least common denominator. Ans. $\frac{11}{12}$, $\frac{4}{12}$, $\frac{3}{12}$, $\frac{4}{12}$.

114. Reduce $\frac{17}{18}$ of $\frac{9}{11}$ of $\frac{6}{4\frac{1}{4}}$, $\frac{2}{3}$, $7\frac{1}{2}$, $6\frac{1}{4}$ to their least common denominator. Ans. $1\frac{12}{132}$, $\frac{88}{132}$, $7\frac{66}{132}$, $6\frac{33}{132}$.

115 Reduce $\frac{14}{15}$, $\frac{7}{10}$ to fractions whose denominators shall be 30. Ans. $\frac{28}{30}$, $\frac{21}{30}$.

116. Reduce $\frac{4}{5}$, $\frac{6}{7}$, and 1 to fractions whose denominators shall be 70. Ans. $\frac{56}{70}$, $\frac{60}{70}$, and $\frac{70}{70}$.

117. Reduce $\frac{3}{20}$, $\frac{4}{50}$, $\frac{7}{15}$, and $\frac{11}{25}$ to fractions whose denominators shall be 300. Ans. $\frac{45}{300}$, $\frac{24}{300}$, $\frac{140}{300}$, $\frac{132}{300}$.

ADDITION.

Art. 130. To add simple fractions,

Rule.—*Reduce the fractions to their least common denominator, add their numerators together and place the sum over the common denominator; if the result be an improper fraction reduce it to a whole or mixed number.*

118. Add $\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{5}{12}$ and $\frac{7}{16}$. Ans. $2\frac{47}{48}$.

119. Add $\frac{4}{9}$, $\frac{7}{10}$, $\frac{5}{8}$ and $\frac{17}{18}$. Ans. $2\frac{257}{360}$.

120. Add $\frac{6}{7}$, $\frac{5}{14}$, $\frac{11}{21}$ and $\frac{2}{3}$. Ans. $2\frac{17}{42}$.

121. Add $\frac{5}{9}$, $\frac{8}{27}$, $\frac{1}{3}$, $\frac{4}{5}$ and $\frac{5}{6}$. Ans. $2\frac{221}{270}$.

122. Add $\frac{7}{12}$, $\frac{1}{6}$, $\frac{3}{8}$, $\frac{11}{16}$ and $\frac{1}{2}$. Ans $2\frac{5}{16}$.

123. What is the sum of $\frac{4}{7}$, $\frac{9}{14}$, $\frac{4}{5}$, $\frac{2}{21}$, and $\frac{1}{8}$?

Ans. $2\frac{197}{840}$.

124. What is the sum of $\frac{3}{11}$, $\frac{4}{15}$, $\frac{9}{22}$, $\frac{1}{5}$ and $\frac{8}{9}$?

Ans. $2\frac{37}{990}$.

125. What is the sum of $\frac{5}{13}$, $\frac{11}{39}$, $\frac{2}{3}$, and $\frac{11}{12}$?

Ans. $2\frac{1}{4}$.

126. Add $\frac{7}{10}$, $\frac{11}{100}$, $\frac{1}{50}$, $\frac{3}{20}$ and $\frac{2}{5}$. Ans. $1\frac{38}{100}$.

127. Add $\frac{4}{5}$, $\frac{13}{15}$, $\frac{18}{25}$, $\frac{19}{45}$ and $\frac{44}{75}$. Ans. $3\frac{89}{225}$.

Art. 131. To add mixed numbers,

Rule.—*Add the fractions, and to their sum add the sum of the whole numbers.*

128. Add $4\frac{1}{2}$, $6\frac{1}{3}$, $2\frac{1}{4}$ and $\frac{5}{6}$. Ans. $13\frac{11}{12}$.

129. Add $10\frac{3}{8}$, $7\frac{1}{3}$, $8\frac{2}{9}$ and $16\frac{3}{4}$. Ans. $42\frac{49}{72}$.

130. Add $1\frac{1}{10}$, $6\frac{2}{5}$, $18\frac{19}{20}$ and $2\frac{7}{30}$. Ans. $28\frac{41}{60}$.

131. What is the sum of $2\frac{8}{11}$, $6\frac{1}{5}$ and $12\frac{19}{22}$.

Ans. $21\frac{87}{110}$.

132. What is the sum of $67\frac{38}{111}$, $4\frac{9}{37}$, and $600\frac{2}{3}$?

Ans. $672\frac{28}{111}$.

133. Add $2\frac{1}{2}$, $13\frac{1}{7}$, $99\frac{3}{8}$, $512\frac{7}{11}$. Ans. $627\frac{403}{616}$.

134. Add $14\frac{6}{19}$, $3\frac{14}{57}$ and $88\frac{9}{10}$. Ans. $106\frac{263}{570}$.

135. Add $900\frac{1}{10}$, $450\frac{37}{100}$, and $696\frac{9}{10}$.

Ans. $2047\frac{37}{100}$.

136. Add $121\frac{1}{4}$, $98\frac{7}{16}$ and $14\frac{11}{27}$. Ans. $234\frac{41}{432}$.

ART. 132. To add compound and complex fractions,

RULE.—*Reduce the compound and complex fractions to simple ones, and add as before.*

137. Add $\frac{3}{4}$ of 12, $\frac{2}{3}$ of $7\frac{4}{5}$, and $\frac{8}{9}$ of 25.

Ans. $36\frac{19}{45}$.

138. Add $\frac{6}{17}$ of $11\frac{1}{3}$, $\frac{8}{9}$ of $\frac{7}{10}$ of $6\frac{1}{4}$ and $\frac{11}{12}$ of 13.

Ans. $19\frac{29}{36}$.

139. What is the sum of $\frac{6}{7}$ of $1\frac{1}{2}$, $\frac{4}{9}$ of 86 and $\frac{17}{25}$ of 1010? Ans. $726\frac{97}{315}$.

140. What is the sum of $\frac{9}{10}$ oı $7\frac{1}{2}$ of 21, $\frac{4}{7}$ of $18\frac{3}{4}$ and $77\frac{5}{9}$? Ans. $230\frac{5}{252}$.

141. Add $\frac{7}{10}$ of $\frac{4}{5}$ of 20, $\frac{3}{7}$ of $\frac{6}{7}$ of $24\frac{1}{2}$ and $\frac{6}{11}$ of $2\frac{1}{4}$.

Ans. $21\frac{47}{110}$.

142. Add $\frac{4}{25}$ of $9\frac{3}{5}$ and $\frac{4}{21}$ of $869\frac{2}{5}$.

Ans. $167\frac{17}{125}$.

143. Add $\frac{2\frac{1}{2}}{10}$ of 17, and $\frac{3}{4}$ of $\frac{4\frac{1}{4}}{5}$. Ans. $4\frac{71}{80}$.

144. Add $\frac{7}{16}$ of $\frac{5\frac{3}{5}}{9}$, $\frac{18\frac{3}{4}}{75}$ and $\frac{12\frac{1}{2}}{15}$, Ans. $1\frac{16}{45}$.

145. Add $\frac{2}{3}$ of $\frac{4}{5}$ of $11\frac{1}{4}$, $\frac{3}{4}$ of $\frac{8}{9\frac{1}{2}}$ and $\frac{3\frac{3}{5}}{4\frac{1}{2}}$.

Ans. $7\frac{41}{95}$.

146. What is the sum of $\frac{9\frac{3}{4}}{20}$, $\frac{7\frac{1}{2}}{18}$, $\frac{4\frac{1}{2}}{20\frac{1}{4}}$ and $\frac{6}{7}$ of $17\frac{1}{2}$?

Ans. $16\frac{91}{720}$.

147. What is the sum of $\frac{19\frac{1}{2}}{58\frac{1}{2}}$, $\frac{31\frac{1}{4}}{87\frac{1}{2}}$, and $\frac{7}{11}$ of 24?

Ans. $15\frac{445}{462}$.

148. What is the sum of $\frac{12\frac{1}{2}}{30}$, $\frac{4\frac{2}{7}}{9}$, and $\frac{6\frac{1}{2}}{11}$ of $\frac{8\frac{1}{4}}{39}$?

Ans. $1\frac{1}{56}$.

149. What is the sum of $\frac{3\frac{1}{7}}{10}$ of $14\frac{7}{8}$, $\frac{6\frac{3}{7}}{15}$ of $2\frac{2}{9}$ and $\frac{14}{15}$ of $7\frac{1}{12}$. Ans. $12\frac{601}{2520}$.

150. What is the sum of $66\frac{2}{3}$ of $\frac{3}{14\frac{2}{7}}$, $\frac{8\frac{4}{15}}{15\frac{1}{2}}$ and $\frac{2}{3}$ of $\frac{3}{5}$ of $1\frac{2}{3}$ of $\frac{3\frac{1}{4}}{20}$? Ans. $14\frac{7}{12}$

151. A farmer had 3 fields: the 1st. contained $31\frac{5}{8}$ acres; the 2d., $49\frac{3}{7}$ acres, and the 3d., $59\frac{7}{10}$ acres; how many acres had he in all? Ans. $140\frac{211}{280}$ acres.

152. A man earned in one day \$$3\frac{3}{8}$, in the 2d., \$$4\frac{1}{8}$, in the 3d., $5\frac{5}{16}$, in the 4th., \$$7\frac{1}{2}$, in the 5th., \$$4\frac{7}{16}$, and in the 6th., \$$3\frac{5}{8}$; how much did he earn during the week? Ans. \$$28\frac{3}{8}$.

153. There were 5 loads of hay weighed on the county scales; the 1st. weighed $17\frac{2}{5}$ cwt.; the 2d., $19\frac{3}{8}$ cwt.; the 3d $18\frac{2}{5}$ cwt.; the 4th., $19\frac{2}{3}$ cwt.; and the 5th., $16\frac{5}{16}$ cwt.; how much did the 5 loads weigh? Ans. $91\frac{37}{240}$.

154. A grocer bought 7 firkins of butter, weighing respectively $55\frac{1}{4}$, $54\frac{3}{4}$, $55\frac{2}{3}$, $56\frac{2}{5}$, $53\frac{7}{8}$, 56 and $55\frac{2}{9}$ lbs.; how much did they weigh together? Ans. $387\frac{59}{360}$ lb.

155. If a person work on Monday $8\frac{3}{5}$ hours, on Tuesday, $9\frac{2}{3}$ hours, on Wednesday, $8\frac{3}{10}$ hours, on Thursday, $10\frac{3}{4}$ hours, on Friday, $9\frac{4}{5}$ hours, and on Saturday, $10\frac{1}{8}$ hours; how many hours will he have worked during the week? Ans. $57\frac{29}{120}$ hours.

156. A person travelled in one day $17\frac{2}{7}$ miles; in the second, $\frac{3}{4}$ of what he went the first day; on the third, $22\frac{7}{8}$ miles; and on the fourth $36\frac{1}{4}$ miles; how far did he travel in 4 days. Ans. $89\frac{5}{8}$ miles.

157. A cartman carried in one load $16\frac{2}{5}$ cwt.; in a second, $17\frac{2}{7}$ cwt.; in a third, $\frac{1}{2}$ of the sum of the other two; how much did he carry in the three loads? Ans. $50\frac{37}{70}$ cwt.

SUBTRACTION.

Art. 133. To subtract simple fractions,

Rule.—*Reduce the fractions to a common denominator, subtract the less numerator from the greater, and place the difference over the common denominator.*

158. Subtract $\frac{3}{8}$ from $\frac{1}{2}$.	Ans. $\frac{1}{8}$.
159. Subtract $\frac{4}{7}$ from $\frac{7}{9}$.	Ans. $\frac{13}{63}$.
160. Subtract $\frac{11}{12}$ from $\frac{19}{20}$.	Ans. $\frac{1}{30}$.
161. Subtract $\frac{1}{3}$ from $\frac{16}{45}$.	Ans. $\frac{1}{45}$.

162. From $\frac{6}{11}$ take $\frac{3}{10}$. Ans. $\frac{27}{110}$.
163. From $\frac{18}{25}$ take $\frac{9}{50}$. Ans. $\frac{27}{50}$.
164. From $\frac{29}{37}$ take $\frac{11}{17}$. Ans. $\frac{86}{629}$.
165. From $\frac{17}{27}$ take $\frac{11}{35}$. Ans. $\frac{298}{945}$.

ART. 134. To subtract mixed numbers,

RULE.—*Place the less mixed number under the greater, with the whole numbers and fractions under each other; subtract the fractions first, and afterwards the whole numbers; if the under fractions be greater than the upper add a unit to the upper fraction, and subtract the under one from their sum, set down the difference and carry* "ONE" *to the units of the subtrahend, and proceed as in simple sub straction.*

166. From $25\frac{3}{4}$ take $15\frac{2}{3}$. Ans. $10\frac{1}{12}$.
167. From $195\frac{2}{3}$ take $118\frac{1}{5}$. Ans. $77\frac{7}{15}$.
168. From $75\frac{3}{8}$ take $12\frac{2}{7}$. Ans. $63\frac{5}{56}$.
169. From $166\frac{2}{3}$ take $111\frac{1}{9}$. Ans. $55\frac{5}{9}$.
170. From $1149\frac{4}{5}$ take $249\frac{7}{12}$. Ans. $900\frac{13}{60}$.
171. Subtract $796\frac{3}{10}$ from $1344\frac{4}{10}$. Ans. $548\frac{1}{10}$.
172. Subtract $45\frac{3}{4}$ from $98\frac{1}{2}$. Ans. $52\frac{3}{4}$.
173. Subtract $65\frac{1}{10}$ from $150\frac{1}{20}$. Ans. $84\frac{19}{20}$.
174. Subtract $700\frac{4}{5}$ from $1000\frac{3}{10}$. Ans. $299\frac{1}{2}$.
175. Subtract $499\frac{7}{11}$ from $1099\frac{1}{4}$. Ans. $599\frac{27}{44}$.
176. Subtract $3867\frac{11}{12}$ from $4019\frac{7}{25}$.
Ans. $151\frac{109}{300}$.
177. Subtract $691\frac{4}{51}$ from $1008\frac{1}{60}$.
Ans. $316\frac{957}{1020}$.
178. Subtract $386\frac{99}{100}$ from $1440\cdot\frac{99}{1000}$.
Ans. $1053\frac{109}{1000}$.

Art. 135. To subtract compound and complex fractions,

Rule.—*Reduce them to simple fractions, and subtract as before.*

179. From $\frac{1}{2}$ of $\frac{3}{4}$ take $\frac{2}{3}$ of $\frac{1}{20}$. Ans. $\frac{41}{120}$.

180. From $\frac{1}{5}$ of $3\frac{3}{4}$ take $\frac{1}{10}$ of $2\frac{1}{2}$. Ans. $\frac{1}{2}$.

181. From $\frac{2}{9}$ of $7\frac{3}{5}$ take $\frac{1}{4}$ of $2\frac{1}{4}$, Ans. $1\frac{91}{720}$.

182. From $\frac{2}{3}$ of $6\frac{3}{4}$ take $\frac{2}{9}$ of $\frac{1}{3}$ of $1\frac{1}{2}$.
Ans. $4\frac{7}{18}$.

183. From $\dfrac{6\frac{3}{4}}{20}$ take $\dfrac{2\frac{1}{2}}{12}$. Ans. $\frac{31}{240}$.

184. From $\dfrac{4}{11\frac{1}{5}}$ take $\dfrac{1\frac{1}{2}}{24}$. Ans. $\frac{33}{112}$.

185. From $\dfrac{9\frac{1}{2}}{11\frac{3}{4}}$ take $\dfrac{\frac{2}{3}}{7}$. Ans. $\frac{704}{987}$.

186. From $\frac{5}{7}$ of $\frac{2}{3}$ of $3\frac{1}{2}$ take $\frac{9}{10}$ of $\frac{9}{10}$.
Ans. $\frac{257}{300}$.

187. From $\frac{7}{11}$ of $6\frac{3}{4}$ take $\frac{1}{8}$ of $\dfrac{1\frac{2}{3}}{5}$. Ans. $4\frac{67}{264}$.

188. From $\dfrac{9\frac{1}{2}}{25\frac{1}{3}}$ take $\dfrac{8\frac{1}{2}}{25}$. Ans. $\frac{7}{200}$.

189. A man had \$100, out of which he spent $\$43\frac{3}{4}$; how much had he left? Ans, $\$56\frac{1}{4}$.

190. John has $\$4\frac{7}{18}$; William $\$3\frac{5}{16}$; how much more has John than William? Ans. $\$\frac{1}{2}$ or 50 cts.

191. A person having $\$49\frac{3}{4}$, went to Boston, to which place the fare was $\$4\frac{3}{4}$; he afterwards went from Boston to Portland, and that cost $\$5\frac{7}{10}$; how much had he left when he arrived at Portland? Ans. \$39.30.

192. A man bought a firkin of butter weighing $56\frac{3}{10}$ lb.; he sold $\frac{1}{2}$ of it to one person, and $13\frac{2}{7}$ lb. to another; how much had he left? Ans. $14\frac{79}{140}$ lbs.

193. A merchant bought 2 pieces of cloth; the first piece was $38\frac{3}{8}$ yd. long, and the second, $41\frac{4}{7}$ yd. He sold $59\frac{1}{4}$ yd; how many yards had he left?

Ans. $20\frac{39}{56}$ yd.

194. A grocer bought 2 hhd. of sugar, each weighing 1302 lb; he sold $\frac{1}{3}$ of one hhd., and 455 $\frac{2}{11}$ lb. of the other; how much had he left out of both hhd?

Ans. $1714\frac{9}{11}$ lb.

195. A jeweller had 3 parcels of gold; the 1st weighed 1 lb. $5\frac{1}{2}$ oz., the 2d., $12\frac{3}{4}$ oz., and the 3d., 3 lb. $8\frac{1}{2}$ oz. He manufactured $\frac{3}{4}$ of the whole into spoons, and sold 1 lb. of it; how many ounces had he left?

Ans. $6\frac{11}{16}$ oz.

196. A wine merchant bought 2 pipes of wine; the 1st gauged $116\frac{5}{8}$ gal.; the 2d., $119\frac{3}{16}$. To one person he sold 39 gal., to another $45\frac{4}{5}$ gal., and to a third, $100\frac{1}{4}$ gal; how many gallons had he left? Ans. $50\frac{7}{8}$ gal.

197. From $\frac{2}{3}$ of $\frac{17}{20}$ take $\frac{1}{15}$ of $\frac{1}{10}$ of $7\frac{1}{2}$.

Ans. $\frac{31}{60}$.

198. Subtract $\frac{2}{3}$ of $1\frac{2}{19}$ from $\frac{1}{8}$ of $1\frac{2}{3}$ of 5.

Ans. $\frac{139}{456}$.

199. Subtract $\frac{11}{12}$ of $\frac{1}{2}$ of $1\frac{1}{4}$ from $\frac{6}{7}$ of $\frac{3}{5}$ of $\dfrac{6\frac{3}{4}}{9}$.

Ans. $\frac{1941}{3360}$.

200. A merchant bought 2 lots of corn; the first measured 1000 bushels, and the second, $1298\frac{3}{4}$ bushels; he sold $\frac{1}{3}$ of the first lot and $\frac{1}{5}$ of the second; how much more did he sell out of the first lot than out of the second? Ans. $99\frac{7}{12}$ bu.

201. A person bought a house for $3450, and sold it for 2221\frac{1}{5}$; he bought another house for 6506\frac{1}{2}$, and

sold it for \$7000; did he gain or lose by the two transactions, and how much? Ans. $\$378\frac{3}{4}$ gain.

202. A person at his death left by his will \$100000 to be distributed as follows; \$50000 to his wife, $24187\frac{1}{2}$ to his son, $12090\frac{7}{24}$ to his daughter, and the remainder to a charitable institution; how much did the institution receive? Ans. $\$13722\frac{5}{24}$.

203. A company proposed to raise \$1000000; the expenses attending were estimated at $\$2812\frac{3}{8}$; A subscribed \$150000, B $45911\frac{1}{9}$, C $\$496324\frac{2}{7}$, and D the balance; how much must he subscribe in order to raise the capital, and pay the expenses?

Ans. $\$310576\frac{493}{504}$.

MULTIPLICATION.

ART. 136. To multiply a fraction and whole number together,

RULE.—*Multiply the numerator of the fraction by the whole number, and place the product over the denominator; or, cancel the factors that are common to the denominator and whole number, and multiply as before.*

NOTE.—The word "of," used in compound fractions, is equivalent to the sign ×.

204. Multiply $\frac{4}{7}$ by 8. Ans. $4\frac{4}{7}$.
205. Multiply $\frac{5}{9}$ by 16. Ans. $8\frac{8}{9}$.
206. Multiply 13 by $\frac{6}{11}$. Ans. $7\frac{1}{11}$.
207. Multiply 15 by $\frac{9}{10}$. Ans. $13\frac{1}{2}$.
208. Multiply 28 by $\frac{17}{21}$. Ans. $22\frac{2}{3}$.
209. Multiply $\frac{21}{25}$ by 18. Ans. $15\frac{3}{25}$.
210. What is the product of 39 and $\frac{16}{19}$?

Ans. $32\frac{16}{19}$.

211. What is the product of $\frac{29}{30}$ by 85?

Ans. $82\frac{1}{6}$.

212. What is the product of $\frac{63}{70}$ by 44?

Ans. $39\frac{3}{5}$.

Art. 137. To multiply a mixed number by a whole number,

Rule.—*Multiply the fraction of the mixed number by the whole number, and to the product add the product of the two whole numbers.*

213. Multiply $7\frac{7}{8}$ by 8.	Ans. 63.
214. Multiply $8\frac{7}{10}$ by 15.	Ans. $130\frac{1}{2}$.
215. Multiply 47 by $3\frac{3}{4}$.	Ans. $176\frac{1}{4}$.
216. Multiply 19 by $6\frac{5}{6}$.	Ans. $129\frac{5}{6}$.
217. Multiply $45\frac{11}{13}$ by 5.	Ans. $229\frac{3}{13}$.
218. Multiply $754\frac{5}{18}$ by 63.	Ans. $47519\frac{1}{2}$.
219. Multiply 208 by $17\frac{6}{23}$.	Ans. $3590\frac{6}{23}$.
220. Multiply 3000 by $7\frac{7}{8}$.	Ans. 23625.
221. Multiply $407\frac{7}{30}$ by 188.	Ans. $76559\frac{13}{15}$.

Art. 138. To multiply two or more fractions together,

Rule.—*Cancel the factors common to the numerators and denominators, and then multiply the remaining numerators together for the numerator of the product, and the remaining denominators together for the denominator of the product.*

If there be mixed numbers reduce them to improper fractions.

If there be compound or complex fractions reduce them to simple fractions.

222. Multiply $\frac{2}{5}$ by $\frac{8}{9}$.	Ans. $\frac{16}{45}$.
223. Multiply $\frac{4}{17}$ by $\frac{14}{15}$.	Ans. $\frac{56}{255}$.

224. Multiply $\frac{6}{11}$ by $\frac{2}{5}$. Ans. $\frac{12}{55}$.

225. Multiply $\frac{8}{9}$, $\frac{7}{16}$ and $\frac{3}{16}$ together. Ans. $\frac{7}{96}$.

226. Multiply $8\frac{8}{9}$ by $\frac{6}{7}$. Ans. $7\frac{13}{21}$.

227. Multiply $\frac{17}{19}$ by $12\frac{2}{3}$. Ans. $11\frac{1}{3}$.

228. Multiply $7\frac{1}{2}$ by $18\frac{3}{4}$. Ans. $140\frac{5}{8}$.

229. Multiply $37\frac{11}{13}$ by $61\frac{3}{5}$. Ans. $2331\frac{21}{65}$.

230. Multiply $\frac{2}{3}$ of 17 by $\frac{13}{15}$. Ans. $9\frac{37}{45}$.

231. Multiply $13\frac{2}{7}$ by $\frac{1}{2}$ of $8\frac{2}{5}$. Ans. $55\frac{4}{5}$.

232. Multiply $66\frac{2}{3}$ by $\frac{7}{8}$ of $16\frac{9}{10}$. Ans. $985\frac{5}{6}$.

233. Multiply $\frac{6}{11}$ of $\frac{2}{3}$ by $\frac{19}{24}$ of 16. Ans. .

234. Multiply $\frac{5}{9}$ of $\frac{3}{4}$ of $7\frac{1}{5}$ by $\frac{1}{4}$ of 99. Ans. $74\frac{1}{4}$.

235. Multiply $\frac{4}{15}$ of 3125 by $\frac{2}{7}$ of 3000.

Ans. $714285\frac{5}{7}$.

236. What is the product of $\frac{5}{11}$ of $\frac{6}{7}$ of $1\frac{18}{21}$ by $\frac{17}{19}$ of 2001? Ans. $1295\frac{4535}{10241}$.

237. What is the product of $\frac{3\frac{1}{4}}{13}$ by 18? Ans. $4\frac{1}{2}$.

238. What is the product of 196 by $\frac{7\frac{11}{12}}{14}$?

Ans. $110\frac{5}{6}$.

239. What is the product of $\frac{3}{5\frac{2}{5}}$ by 6100?

Ans. $3388\frac{8}{9}$.

240. What is the product of $\frac{7\frac{1}{2}}{11\frac{2}{9}}$ by 43?

Ans. $28\frac{149}{202}$

241. Multiply $\frac{7}{10}$ by $\frac{8\frac{1}{2}}{12}$. Ans. $\frac{119}{240}$

242. Multiply $\frac{31}{50}$ by $\frac{17}{20\frac{2}{5}}$. Ans. $\frac{31}{60}$

243. Multiply $6\frac{3}{4}$ by $\frac{12\frac{1}{3}}{16}$. Ans. $5\frac{13}{64}$.

244. Multiply $\frac{5\frac{1}{3}}{18\frac{2}{5}}$ by $\frac{11\frac{11}{12}}{12\frac{1}{10}}$. Ans. $\frac{650}{2277}$.

245. What is the product of $\frac{3\frac{2}{7}}{5}$, $\frac{12}{13\frac{1}{5}}$ and $\frac{99\frac{1}{2}}{100\frac{3}{4}}$? Ans. $\frac{18308}{31031}$.

246. What is the product of $\frac{9\frac{1}{16}}{18\frac{1}{8}}$ by $\frac{7}{11}$ of $\frac{18}{19}$ of $5\frac{3}{7}$? Ans. $1\frac{7}{11}$.

247. What is the product of $\frac{21}{22}$ of $\frac{14\frac{1}{3}}{20}$, and $\frac{4}{5}$ of $\frac{3}{10}$ of $\frac{8\frac{1}{4}}{12}$ of 100? Ans. $9\frac{873}{1403}$.

When the value of a single article is given, how can the value of any number of articles be found? (Art. 34.)

When the quantity that can be obtained for one dollar, one shilling, &c. is given, how can the corresponding quantity for any number of dollars, shillings, &c., be found?

248. What will 94 yards of muslin cost at $\frac{3}{5}$ of a dollar per yard? Ans. \$$56\frac{2}{5}$.

249. What will $\frac{7}{12}$ of a bushel cost at 75 cts. a bushel? Ans. $43\frac{3}{4}$ cents.

250. What will 171 acres cost at $\frac{15}{16}$ dollars an acre? Ans. \$$160\frac{5}{16}$.

251. What will 166 gallons cost at £$\frac{11}{15}$ a gallon? Ans. £$121\frac{11}{15}$.

252. What will $\frac{4}{25}$ of a pound cost a 15 cts. a pound? Ans. $2\frac{2}{5}$ cents.

253. If 251 yards of cloth can be exchanged for one acre; how many yards can be obtained for $\frac{17}{18}$ of an acre? Ans. $237\frac{1}{18}$ yards.

254. What is the price 17 loads of wood at $2¾ per load? Ans. $46¾.

255. What will 10½ yd. of cloth cost at $7 per yd. Ans. $73½.

256. If one hhd. of molasses cost 17\frac{7}{11}$, what will 100 hhd. cost? Ans. 1763\frac{7}{11}$.

257. If a man can earn $33⅓ in one week, how much can he earn in 52 weeks? Ans. $1733⅓.

258. What must be paid for 600 barrels of flour at $5⅜ per barrel? Ans. $3225.

259. What will be the cost of a square mile of land at 131\frac{5}{9}$ per acre? Ans. 84195\frac{5}{9}$.

260. If it take 10509$\frac{7}{11}$ ft. of boards to build a house, how many feet will be required to build 7 houses? Ans. 73567$\frac{5}{11}$ ft.

261. A merchant bought 100 barrels of flour for $6⅞ per barrel; he sold 49 barrels at $7½ per barrel, and the rest at $7⅛ a barrel; how much did he gain? Ans. $43⅜.

262. A farmer bought 43 acres of land at $104¾ an acre; 16 cows at $28⅝ each; 2 ploughs at 11\frac{6}{13}$ each; what was the total amount? Ans. 4985\frac{9}{52}$.

263. What cost 33⅓ lb. of tea at 93¾ cts. per lb.? Ans. $31.25.

264. What will 45$\frac{2}{7}$ gallons cost at 2\frac{11}{12}$ per gallon? Ans. 132\frac{1}{12}$.

265. What will 180⅘ acres cost at 255\frac{7}{16}$ per acre? Ans. 46183\frac{1}{10}$.

266. A person bought 1800 bushels of corn for 44⅔ cts. per bushel; 1660½ bushels of wheat at 87½ cts. per bushel, and 380$\frac{5}{9}$ bushels of rye, at 53 cts. per bushel; what was the value of the whole? Ans. 2458.63\frac{7}{36}$.

267. A man bought a farm containing $319\frac{3}{7}$ acres, at \$200 per acre; he sold $250\frac{4}{9}$ acres at \$250 per acre; and the remainder at $\$266\frac{2}{3}$ per acre; how much did he gain? Ans. $\$17111\frac{121}{189}$.

268. A had $£788\frac{5}{9}$, B had $£600\frac{18}{25}$, A tripled his money, and B quadrupled his; how much did they then have together? Ans. $£4768\frac{41}{75}$.

DIVISION.

Art. 139. To divide a fraction by a whole number,

Rule.—*Divide the numerator of the fraction if possible by the whole number, and place the quotient over the denominator; or, multiply the denominator of the fraction by the whole number, and place the product under the numerator.*

Art. 140. To divide a whole number by a fraction,

Rule.—*Invert the fraction and multiply it by the whole number.*

269. Divide $\frac{14}{15}$ by 7. Ans. $\frac{2}{15}$.
270. Divide $\frac{16}{25}$ by 4. Ans. $\frac{4}{25}$.
271. Divide $\frac{7}{8}$ by 5. Ans. $\frac{7}{40}$.
272. Divide $\frac{13}{14}$ by 6. Ans. $\frac{13}{84}$.
273. Divide $\frac{28}{37}$ by 4. Ans. $\frac{7}{37}$.
274. Divide $\frac{17}{18}$ by 12. Ans. $\frac{17}{216}$.
275. Divide 15 by $\frac{3}{4}$. Ans. 20.
276. Divide 27 by $\frac{9}{10}$. Ans. 30.
277. Divide 48 by $\frac{11}{12}$. Ans. $52\frac{4}{11}$.
278. Divide 100 by $\frac{10}{13}$. Ans. 130.
279. Divide 500 by $\frac{3}{8}$ Ans. $1333\frac{1}{3}$.

280. Divide $\frac{147}{151}$ by 28. Ans. $\frac{21}{604}$.

281. Divide $\frac{603}{800}$ by 54. Ans. $\frac{67}{4800}$.

282. Divide 750 by $\frac{100}{147}$. Ans. $1102\frac{1}{2}$.

283. Divide 1000 by $\frac{6}{7}$. Ans. $1166\frac{2}{3}$.

284. Divide 1499 by $\frac{31}{50}$. Ans. $2417\frac{23}{31}$.

Art. 141. To divide a mixed number by a whole number,

Rule. *If the dividend be less than the divisor, write the divisor under the dividend in the form of a complex fraction, and reduce to a simple fraction; if the dividend be greater than the divisor, divide as in simple division, and place the remainder over the divisor, which will also form a complex fraction to be reduced.*

Art. 142. To divide a whole number by a mixed number,

Rule.—*Reduce the mixed number to an improper fraction, invert it and multiply it by the whole number.*

Art. 143. To divide fractions generally,

Rule.—*Invert the divisor, reduced if necessary, and multiply it by the dividend, also reduced; observe the rules for multiplication of fractions, and cancel if possible.*

285. Divide $3\frac{3}{4}$ by 5. Ans. $\frac{3}{4}$.

286. Divide $14\frac{7}{8}$ by 27. Ans. $\frac{119}{216}$.

287. Divide $459\frac{2}{3}$ by 600. Ans. $\frac{1379}{1800}$.

288. Divide 48 by $3\frac{3}{8}$. Ans. $14\frac{2}{9}$.

289. Divide 75 by $14\frac{3}{10}$. Ans. $5\frac{35}{143}$.

290. Divide $114\frac{1}{2}$ by 6. Ans. $19\frac{1}{12}$.

291. Divide $259\frac{3}{5}$ by 12. Ans. $21\frac{19}{30}$.

292. Divide $3479\frac{7}{8}$ by 18. Ans. $193\frac{47}{144}$.

293. Divide $16008\frac{7}{12}$ by 39 Ans. $410\frac{223}{468}$.

294. Divide 10000 by $22\frac{3}{4}$. Ans. $439\frac{51}{91}$.
295. Divide 148967 by $59\frac{7}{18}$. Ans. $2508\frac{354}{1069}$.
296. Divide $3008\frac{55}{61}$ by 11. Ans. $273\frac{360}{671}$.
297. Divide $143016\frac{11}{19}$ by 25. Ans. $5720\frac{63}{95}$.
298. Divide $\frac{5}{8}$ by $3\frac{3}{4}$. Ans. $\frac{1}{6}$.
299. Divide $7\frac{1}{2}$ by $10\frac{2}{3}$. Ans. $\frac{45}{64}$.
300 Divide $\frac{13}{14}$ by $\frac{7}{12}$ Ans. $1\frac{29}{49}$.
301. Divide $\frac{16}{17}$ by $17\frac{3}{8}$. Ans. $\frac{128}{2363}$.
302. Divide $286\frac{3}{10}$ by $\frac{5}{21}$. Ans. $1202\frac{23}{50}$.
303. Divide $300\frac{4}{25}$ by $6\frac{1}{4}$. Ans. $48\frac{16}{625}$.
304. Divide $\frac{45}{82}$ by $\frac{15}{64}$. Ans. $2\frac{14}{41}$.
305. Divide $\frac{455}{651}$ by $\frac{33}{40}$. Ans. $\frac{18200}{21483}$.
306. Divide $611\frac{7}{12}$ by $20\frac{7}{11}$. Ans. $29\frac{1733}{2724}$.
307. Divide 10000 by $16\frac{3}{8}$. Ans. $610\frac{90}{131}$.
308. Divide $100\frac{17}{30}$ by $166\frac{2}{3}$. Ans. $\frac{3017}{5000}$.
309. Divide $111\frac{1}{9}$ by $33\frac{1}{3}$. Ans. $3\frac{1}{3}$.
310. Divide $\frac{401}{500}$ by $57\frac{2}{7}$. Ans. $\frac{7}{500}$.
311. Divide $\frac{2}{3}$ of $\frac{17}{18}$ by $\frac{9}{10}$ of $\frac{4}{5}$. Ans. $\frac{425}{486}$.
312. Divide $\frac{4}{7}$ of $3\frac{3}{4}$ by $\frac{19}{20}$ of $7\frac{1}{2}$. Ans. $\frac{40}{133}$.
313. Divide $\frac{5}{9}$ of $7\frac{1}{11}$ of $6\frac{1}{9}$ by $\frac{3}{7}$ of $19\frac{1}{2}$.
Ans. $2\frac{214}{243}$.
314. Divide $\frac{5}{12}$ of $6\frac{1}{4}$ by $\frac{7}{12\frac{1}{2}}$. Ans. $4\frac{437}{672}$.
315. Divide $5\frac{5}{9}$ of $\frac{3\frac{3}{4}}{10\frac{1}{2}}$ by $\frac{7}{10}$ of $\frac{4\frac{1}{2}}{9}$. Ans. $5\frac{295}{441}$.
316. What part of $16\frac{1}{2}$ is $8\frac{1}{4}$? Ans. $\frac{1}{2}$.
317. What part of $3\frac{7}{8}$ is $1\frac{1}{2}$? Ans. $\frac{12}{31}$.
318. What part of $191\frac{1}{5}$ is $159\frac{1}{3}$. Ans. $\frac{5}{6}$.
319. How many times does $1301\frac{2}{5}$ contain $161\frac{3}{10}$?
Ans. $8\frac{110}{1613}$.

320. Divide $\frac{3}{4}+9\frac{1}{3}$ by $2\frac{1}{3}+6$. Ans. $1\frac{37}{200}$.

321. Divide $15\frac{3}{4}-11\frac{1}{12}$ by $\frac{3\frac{1}{7}}{11}+\frac{2}{3}$. Ans. $4\frac{1}{40}$.

When the value of a single artiele and the value of several are known, how can the number of articles be found? (Act. 54.)

When the number of articles and their value are known, how can the value of a single article be found? (Art. 53.)

NOTE.—The divisor and dividend must be of the same denomination except when the value of a single article is found.

322. If 1 pound of sugar cost $\$\frac{5}{16}$, how many pounds can be bought for $100? Ans. 320 lb.

323. If 17 pounds of rice cost $\$\frac{3}{5}$, what will one pound cost? Ans. $\$\frac{3}{85}$ or $3\frac{9}{17}$ cents.

324. If 25 pounds of coffee cost $\$\frac{12}{13}$, what will one pound cost? Ans. $\$\frac{12}{325}$ or $3\frac{9}{13}$ cents.

325. If 13 yd. of muslin cost $\frac{9}{25}$, what will one yard cost? Ans. $\$\frac{9}{325}$.

326. If $\frac{3}{8}$ bu. cost $1, how much will 30 bushels cost? Ans. $80.

327. If $\frac{5}{9}$ gal. cost $1, what will 300 gallons cost? Ans. $540.

328. If $\frac{7}{8}$ of a ton cost $13, what will one ton cost? Ans. $\$14.85\frac{5}{7}$.

329. If $\frac{13}{15}$ bbl. cost $100, what will one barrel cost? Ans. $\$115.38\frac{6}{13}$.

330. If $\frac{3}{20}$ cwt. of coffee cost £1, how much will 350 cwt. cost? Ans. £$2333\frac{1}{3}$.

331. If $39\frac{5}{21}$ lb. of sugar cost $29\frac{3}{7}$ shillings, what will 1 pound cost? Ans. $\frac{3}{4}$*s*.

332. If $368\frac{3}{4}$ yd. of cloth cost $\$1843\frac{3}{4}$, what will 1 yd. cost? Ans. $5.

333. If $28\frac{7}{15}$ bushels cost \$100, what will one bushel cost? Ans. $\$3\frac{219}{427}$.

334. If coffee is $13\frac{7}{8}$ cts. per pound, how many pounds can you buy for \$10? Ans. $72\frac{8}{111}$ lb

335. How many bushels of wheat can be bought for £24 15*s.* at $7\frac{1}{2}$ shillings per bushel? Ans. 66 bu.

336. If a pound of tea cost $5\frac{3}{8}$*s.*, how mow many pounds may be bought for £13 17*s.*? Ans. $51\frac{23}{43}$ lb.

337. If $\frac{3}{8}$ yd. cost \$2.78, what will 1 yd. cost? Ans. $\$7.41\frac{1}{3}$.

338. If $\frac{18}{25}$ of an acre cost $\$711\frac{3}{5}$, what is the price of an acre? Ans. $\$988\frac{1}{3}$.

339. If $\frac{13}{20}$ hhd. cost $\$103.27\frac{1}{2}$, what will one hogshead cost? Ans. $\$158.88\frac{6}{13}$.

340. How many pounds of coffee can be bought for $\$78\frac{5}{7}$, at $\frac{3}{16}$ of a dollar per pound? Ans. $419\frac{17}{21}$ lb.

341. How many gallons of wine can be bought for £$37\frac{1}{6}$, at £$\frac{9}{17}$ per gallon? Ans. $70\frac{11}{54}$ gal.

342. If you can buy $\frac{5}{13}$ of a yard for one dollar, how many dollars will buy $1438\frac{3}{4}$ yd. Ans. $\$3740\frac{3}{4}$.

343. If you can purchase $5\frac{1}{4}$ yards of muslin for \$1, how many dollars will 1000 yards cost? Ans. $\$190\frac{10}{21}$.

PROMISCUOUS EXAMPLES.

NOTE.—Indicate the following sums thus, $\frac{2\frac{1}{4}}{3\frac{1}{4}}$ price of one bushel × 2 = price of 2 bushels. This illustrates one of the uses of complex fractions.

344. If $37\frac{1}{2}$ oz. of silver cost $\$31\frac{1}{4}$, what will 150 oz. cost? Ans. \$125.

345. What will $35\frac{7}{8}$ A. cost at $\$145\frac{7}{8}$ for 10 acres? Ans. $\$523\frac{209}{640}$.

346. A person had £$3000\frac{3}{7}$; he divided it into 7 equal parts, and gave $4\frac{1}{2}$ of the parts to a benevolent society; how much did the society receive? Ans. £$1928\frac{83}{98}$.

347. If $3\frac{3}{4}$ bushels of wheat cost $$2\frac{3}{8}$, what will 2 bushels cost? Ans. $$1.26\frac{2}{3}$.

348. If $79\frac{1}{2}$ quarts of black-berries cost $18, what will $10\frac{3}{5}$ quarts cost? Ans. $2.40.

349. What will $6\frac{1}{4}$ lb. of tea cost at $$3\frac{1}{4}$ for $16\frac{1}{4}$ pounds? Ans. $1.25.

350. If 62 acres of land cost $4000, what will $5\frac{3}{5}$ acres cost? Ans. $$361\frac{9}{31}$.

351. If a man travels $401\frac{1}{2}$ miles in $13\frac{1}{4}$ days, how far can he travel in one week, omitting Sunday?
Ans. $181\frac{43}{53}$ mile.

352. If a hogshead of brandy cost $$189.31\frac{1}{2}$, how much will 22 gallons cost? Ans. $66.11.

353. If $17\frac{3}{5}$ gallons of molasses cost $$4\frac{2}{5}$, what will be the price of a hogshead and a half? Ans. $$23\frac{5}{8}$.

354. If $14\frac{4}{9}$ cords of wood cost £39 15*s*., what will $2\frac{3}{5}$ cords cost. Ans. $143\frac{1}{10}$ shillings.

355. If A can mow an acre of ground in 3 days, and B in 2 days, how long would it take them both?
Ans. $1\frac{1}{5}$ days.

356. If A can perform a piece of work in 25 days, and B in 28 days, in what time could they both do it?
Ans. $13\frac{11}{53}$ days.

357. A can build a certain wall in 10 days, B in 12 days, and C in 15 days; suppose the three work together, and find how long it would take them.
Ans. 4 days.

REDUCTION OF DENOMINATE NUMBERS.

ART. 144. To reduce denominate fractions from a higher to a lower denomination,

RULE.—*Multiply the given fraction by as many of the denomination next lower as will make a unit of the given denomination; multiply this result as before, and so proceed till the fraction is reduced to the denomination required.*

NOTE.—If the first product be an improper fraction, it may be reduced to a mixed number; then the whole number may be set aside and the fractional part reduced as in the rule; and if this product be an improper fraction, proceed in like manner; a collection of the whole numbers in the order of their denominations having the last fraction annexed to the lowest denomination will be the answer.

358. Reduce £$\frac{1}{5}$ to shillings. Ans. 4*s.*

359. Reduce £$\frac{1}{3}$ to shillings and pence. Ans. 6*s.* 8*d.*

360. Reduce £$\frac{5}{12}$ to shillings and pence. Ans. 8*s.* 4*d.*

361. What is the value of £$\frac{8}{15}$? Ans. 10*s.* 8*d.*

362. What is the value of £$\frac{7}{25}$? Ans. 5*s.* 7$\frac{1}{5}$*d.*

363. Reduce $\frac{3}{40}$ lb. Troy to its value in lower denominations? Ans. 18 dwt.

364. Reduce $\frac{5}{32}$ of a ton to cwt., quarters, &c. Ans. 3 cwt. 0 qr. 12$\frac{1}{2}$ lb.

365. What is the value in lower denominations of $\frac{4}{11}$ of a mile? Ans. 2. fur. 36 rd. 2 yd.

366. Reduce $\frac{1}{30}$ hhd. to gallons, &c. Ans. 2. gal. 0 pt. 3$\frac{1}{5}$ gi.

367. What is the value of $\frac{7}{9}$ of a mile? Ans. 6 fur. 8rd. 4 yd. 2 ft. 8 in.

368. What is the value of $\frac{7}{25}$ of 2 days? Ans. 13 hr. 26 min. 24 sec.

369. Reduce $\frac{5}{7}$ of an acre to its proper value in lower denominations. Ans. 2 R. 34 sq. rd. 8$\frac{9}{14}$ sq. yd.

370. Reduce $33\frac{4}{5}$ lb. to dwt. Ans. 8112 dwt.

371. Reduce $14\frac{2}{7}$ tons to cwt. and lb.
Ans. $285\frac{5}{7}$ cwt. $28571\frac{3}{7}$ lb.

372. Reduce £$27\frac{1}{3}$ to pence. Ans. 6560*d.*

373. Reduce $31\frac{1}{5}$ bushels to quarts. Ans. $998\frac{2}{5}$ qt.

374. Reduce $12\frac{3}{7}$ miles to yards. Ans $21874\frac{2}{7}$ yd.

375. Reduce $12\frac{7}{9}$ E.E. to inches. Ans. 575 in.

376. Reduce $139\frac{5}{8}$ degrees to miles.
Ans. $9703\frac{15}{16}$ m.

377. Reduce $59\frac{7}{11}$ miles to feet. Ans. 314880 ft.

378. Reduce $459\frac{3}{7}$ acres to square rods.
Ans. $73508\frac{4}{7}$ sq. rd.

379. Reduce $711\frac{2}{5}$ hhd. to quarts. Ans. $179272\frac{4}{5}$.

380. Reduce $12\frac{5}{8}$ years to days, $365\frac{1}{4}$ days to the year. Ans. $4611\frac{9}{32}$ days.

381. Reduce $49\frac{2}{9}$ lb. to scruples. Ans. 14176 ℈.

382. Reduce £18 $7\frac{3}{8}$*s.* to pence. Ans. $4408\frac{1}{2}$*d.*

383. Reduce £918 5*s.* $7\frac{3}{4}$ to pence.
Ans. $220387\frac{3}{4}$*d.*

384. Reduce 11 oz. $17\frac{5}{9}$ dwt. to grains.
Ans. $5701\frac{1}{3}$ gr.

385. Reduce 27 tons 13 cwt. $1\frac{5}{7}$ qr. to lb.
Ans. $55342\frac{6}{7}$ lb.

386. Reduce 13lb. $5\frac{7}{11}$ ℥ to grains.
Ans. $77585\frac{5}{11}$ gr.

387. Reduce 3 yd. $2\frac{5}{8}$ qr. to inches. Ans. $131\frac{5}{8}$ in.

388. Reduce 13 m. $5\frac{5}{17}$ fur. to yards.
Ans. $24044\frac{12}{17}$ yd.

389. Reduce 39 deg. $41\frac{7}{11}$ m. to yards.
Ans. 4843760 yd.

390. Reduce 35 sq. m. $500\frac{3}{8}$ A. to sq. poles.
Ans. 3664060 sq. p.

391. Reduce 1395 $\frac{7}{16}$ cords to cubic feet.
Ans. 178616 cu. ft.

392. Reduce $49\frac{9}{10}$ cu. yd. to cubic inches.
Ans. $2328134\frac{2}{5}$ cu. in.

393. Reduce 49 yr. $34\frac{3}{4}$ days to hours, $365\frac{1}{4}$ days to the year.
Ans. 430368 days.

Art. 145. To reduce a denominate fraction from a lower to a higher denomination,

Rule.—*Divide the given fraction by as many of its own denomination as will make a unit of the denomination next higher; divide this result as before, and so proceed until the fraction is reduced to the denomination required.*

394. Reduce 1 oz. Troy weight to the fraction of a pound.
Ans. $\frac{1}{12}$ lb.

395. Reduce $\frac{7}{12}$ dwt. to the fraction of a pound.
Ans. $\frac{7}{2880}$.

396. Reduce $\frac{4}{5}$ lb. to cwt.
Ans. $\frac{1}{125}$ cwt.

397. Reduce $\frac{7}{8}$ ℥ to the fraction of a pound.
Ans. $\frac{7}{96}$ lb.

398. Reduce $\frac{5}{11}$ oz. to the fraction of a cwt.
Ans. $\frac{1}{3520}$ cwt.

399. Reduce $\frac{15}{16}$ qr. to the fraction of a yard.
Ans. $\frac{15}{64}$.

400. Reduce $\frac{36}{41}$ in. to the fraction of a yard.
Ans. $\frac{1}{41}$ yd.

401. Reduce $\frac{25}{28}$ fur. to the fraction of a mile.
Ans. $\frac{25}{224}$ m.

402. Reduce $\frac{7}{11}$ sq. p. to the fraction of an acre.
Ans. $\frac{7}{1760}$ A.

403. Reduce $\frac{5}{13}$ gal. to the fraction of a hhd.
Ans. $\frac{5}{819}$ hhd.

404. Reduce $\frac{14}{27}$ qt. to the fraction of a bushel.
Ans. $\frac{7}{432}$ bu.

405. Reduce $\frac{17}{18}$ hr. to the fraction of a week.
Ans. $\frac{17}{3024}$ wk.

406. Reduce $1401\frac{1}{2}$ dwt. to pounds.
Ans. $5\frac{403}{480}$ lb.

407. Reduce $6\frac{1}{4}$ lb. to fraction of a cwt.
Ans. $\frac{1}{16}$ cwt.

408. Reduce $5\frac{3}{5}$*d.* to fraction of a pound.
Ans. £$\frac{7}{300}$.

409. Reduce $611\frac{2}{3}$ gr. Apothecaries' weight to drams.
Ans. $10\frac{7}{36}$ ʒ.

410. Reduce $11\frac{2}{7}$ in. to the fraction of a yard.
Ans. $\frac{79}{252}$ yd.

411. Reduce $1000\frac{5}{8}$ in. to ells English.
Ans. $22\frac{17}{72}$ E.E.

412. Reduce $15\frac{3}{4}$ feet to the fraction of a rod.
Ans. $\frac{21}{22}$ rd.

413. Reduce $2854\frac{3}{7}$ yd. to furlongs.
Ans. $12\frac{1501}{1540}$ fur.

414. Reduce $75\frac{9}{10}$ sq. ft. to the fraction of an acre.
Ans. $\frac{23}{13200}$ A.

Art. **146.** To reduce a denominate number containing several denominations to the fraction of a particular denomination,

Rule.—*Place the given number in the numerator and the one with which it is to be compared, in the denominator; reduce both terms to the same denomination, and then reduce them to their simplest terms. Or,*

Reduce the lowest denomination to the fraction of the next higher, and prefix the next higher denomination; reduce this result as before until the whole is reduced to the denomination required.

415. Reduce 3*s.* 4*d.* to the fraction of a £.
Ans. $\frac{1}{6}$ £.

416. Reduce 6*s.* 8*d.* to the fraction of a £.
Ans. $\frac{1}{3}$ £.

417. Reduce 13*s.* 4*d.* to the fraction of a £.
Ans. $\frac{2}{3}$ £.

418. Reduce 5*s.* 6$\frac{1}{4}$*d.* to the fraction of a £.
Ans. £$\frac{53}{192}$.

419. Reduce 6*s.* 5$\frac{5}{8}$*d.* to the fraction of a £.
Ans. $\frac{207}{640}$.

420. Reduce £5 16*s.* 10$\frac{1}{2}$*d.* to the fraction of a £.
Ans. £5$\frac{27}{32}$.

421. Reduce 3 oz. 11 dwt. 15 gr. to the fraction of a pound.
Ans. $\frac{191}{640}$ lb.

422. Reduce 4 cwt. 3 qr. 18 lb. to the fraction of a ton.
Ans. $\frac{493}{2000}$ T.

423. Reduce 3 ℥ 5 ʒ 2$\frac{1}{2}$ ℈ to the fraction of a pound.
Ans. $\frac{179}{576}$ lb.

424. Reduce 901$\frac{3}{5}$ yd. to the fraction of a mile.
Ans. $\frac{1127}{2200}$ m.

425. Reduce 7 sq. p. 11 sq. yd. 8$\frac{1}{4}$ sq. ft. to the fraction of an acre.
Ans. $\frac{61}{1320}$ A.

426. Reduce 2 qr. 3 na. 1$\frac{1}{3}$ in. to the fraction of a yard.
Ans. $\frac{313}{432}$ yd.

427. Reduce 15 hr. 10m. 30 sec. to the fraction of a day.
Ans. $\frac{607}{960}$ day.

428. Reduce 255$\frac{27}{40}$ days to the fraction of a year of 365$\frac{1}{4}$ days.
Ans. $\frac{7}{10}$ yr.

429. Reduce $\frac{2}{3}$ of $\frac{7}{8}$ of 2 bu. 3 pk. to the fraction of 3 bushels.
Ans. $\frac{77}{144}$ of 3 bu.

430. Reduce 13 cwt. 3 qr. 15 lb. to the fraction of a ton
Ans. $\frac{139}{200}$ T.

431. Reduce 3° 15′ 18$\frac{3}{4}$″ to the fraction of a circle.
Ans. $\frac{125}{13824}$ of a circle.

432. Reduce 3$\frac{7}{9}$ in. to the fraction of a hand.
Ans. $\frac{17}{18}$ of a hand.

433. Reduce 55$\frac{1}{4}$ yards to metres.
Ans. 51 metres.

434. Reduce 21$\frac{1}{2}$ yards to metres. Ans. 19$\frac{11}{13}$ m.

435. Reduce 8$\frac{1}{4}$ metres to the fraction of 12$\frac{1}{2}$ yards.
Ans. $\frac{143}{200}$ of 12$\frac{1}{2}$ yd.

436. Reduce 2$\frac{1}{4}$ yards to aunes. Ans. 1$\frac{4}{5}$ aunes.

437. Reduce 45$\frac{3}{5}$ yards to the fraction of 55 aunes.
Ans. $\frac{912}{1375}$ of 55 aunes.

438. Reduce 2 m. 6 fur. 39 p. 5 yd. 2 ft. 11 in. 2 b. c. to the fraction of a league. Ans. $\frac{546533}{570240}$.

ADDITION OF DENOMINATE NUMBERS.

Art. 147. To add denominate fractions,

Rule.—*Reduce the fractions to their value in one or several denominations, and then add as in addition of fractions and denominate numbers.*

439. Add £$\frac{3}{4}$, £$\frac{2}{3}$ and $\frac{1}{6}$*s.* Ans. £1 8*s.* 6*d.*

440. Add £$\frac{7}{8}$, £$\frac{2}{3}$ of $\frac{3}{7}$, $\frac{4}{5}$*s.* and $\frac{3}{4}$*d.*
Ans. £1 4*s.* 0$\frac{129}{140}$*d.*

441. Add $\frac{4}{5}$ lb., 4$\frac{5}{6}$ oz. and 31$\frac{1}{3}$ dwt.
Ans. 1 lb. 4 oz.

442. Add 14$\frac{4}{5}$ lb. 13$\frac{3}{8}$ oz. $\frac{5}{6}$ oz. and 13$\frac{3}{8}$ dr., Avoirdupois weight. Ans. 15 lb. 11 oz. 13$\frac{61}{120}$ dr.

443. Add 2$\frac{3}{11}$ tons, 17$\frac{3}{5}$ cwt. and 2$\frac{3}{7}$ qr.
Ans. 3 T. 3 cwt. 2 qr. 16$\frac{13}{77}$ lb.

444. Add 7$\frac{7}{17}$ lb. 5$\frac{5}{9}$ lb. 6$\frac{3}{5}$ ℥ and 4$\frac{1}{5}$ ʒ.
Ans. 13 lb. 6 ℥ 5 ʒ 2 ℈ 11$\frac{13}{17}$ gr.

445. What is the sum of 24 bu. $3\frac{1}{4}$ pk., 59 bu. 1 pk. $1\frac{1}{2}$ qt., and $13\frac{5}{8}$ bushels? Ans. 97 bu. 1 pk. 7 qt. 1 pt.

446. Add $\frac{7}{8}$ yd., $\frac{3}{5}$ of $\frac{5}{8}$ qr., and $3\frac{1}{3}$ na.
Ans. 1 yd. 2 na. $1\frac{7}{8}$ in.

447. Add $\frac{2}{7}$ of $3\frac{3}{4}$ m., $5\frac{1}{3}$ fur., and $17\frac{1}{2}$ p.
Ans. 1 m. 6 fur. 13 rd. 3 yd. 2 ft. $4\frac{5}{7}$ in.

448. Add $4\frac{1}{5}$ deg., $69\frac{1}{4}$ m., $5\frac{4}{13}$ rods, and $4\frac{3}{4}$ yd.
Ans. 5 deg. 9 m. 5 fur. 14 p. $0\frac{49}{52}$ yd.

449. Add $5\frac{7}{12}$ A., $\frac{2}{3}$ of $6\frac{1}{4}$ A., $\dfrac{9\frac{1}{2}}{12\frac{2}{3}}$ of a rood, and $\frac{3}{11}$ of $2\frac{2}{11}$ sq. p. Ans. 9 A. 3 R. 30 sq. p. 18 sq. yd.

450. Add $\frac{3}{16}$ of a cord, $\frac{5}{9}$ cu. ft., and $\frac{2}{9}$ of $\frac{1}{2}$ of $7\frac{4}{15}$ cu. ft. Ans. 25 cu. ft. $755\frac{1}{5}$ cu. in.

451. What is the sum of $\dfrac{3\frac{3}{5}}{5}$ of $2\frac{1}{2}$ hhd., $\frac{4}{7}$ of 22 gal., and $\frac{1}{3}$ of $5\frac{1}{2}$ qt.? Ans. 2 hhd. 0 gal. 1 qt. $1\frac{46}{105}$ pt.

452. What is the sum of $\dfrac{7\frac{1}{2}}{8\frac{1}{3}}$ of a bushel, $16\frac{2}{3}$ pk., and $\frac{5}{8}$ of $\frac{56}{75}$ of $3\frac{1}{3}$ qt.? Ans. 5 bu. 0 pk. $3\frac{31}{45}$ qt.

453. What is the sum of $\frac{5}{9}$ of $365\frac{1}{4}$ days, $\frac{3}{4}$ of $5\frac{5}{9}$ weeks, and $49\frac{1}{7}$ minutes?
Ans. 33 wk. 1 da. 2 hr. $49\frac{1}{7}$ min.

454. What is the sum of $\frac{3}{19}$ of a circle, $3\frac{5}{8}$ signs, $\frac{2}{3}$ of a degree, and $\frac{2}{9}$ of $5\frac{1}{7}$ minutes?
Ans. 5 signs 16° 16′ $40\frac{20}{133}$″.

455. What is the sum of 5 T. $19\frac{4}{7}$ cwt., $3\frac{4}{7}$ qr., $1\frac{5}{11}$ cwt., 6 T. $3\frac{1}{5}$ qr. $18\frac{2}{3}$ lb., $4\frac{1}{2}$ T. $16\frac{3}{8}$ cwt., and 15 T. 16 cwt. 1 qr. $2\frac{1}{5}$ lb.?
Ans. 33 T. 5 cwt. 2 qr. $5\frac{577}{2310}$ lb.

SUBTRACTION OF DENOMINATE NUMBERS.

Art. 149. To subtract denominate fractions,

Rule.—*Reduce the fractions to their value in various denominations, and then subtract as in subtraction of fractions and denominate numbers.*

456. From £$\frac{2}{3}$, take 3*s.* 6*d.* Ans. 9*s.* 10*d.*

457. From \$$\frac{2}{3}$, take 50 cts. Ans. 16$\frac{2}{3}$ cts.

458. From $\frac{6}{7}$ of a ton, take $\frac{3}{11}$ cwt.
Ans. 16 cwt. 3 qr. 12$\frac{1}{77}$ lb.

459. From \$$\frac{5}{16}$, take 2*s.* 6*d.* Ans. 0.

460. From $\frac{14}{17}$ sq. m., take 252$\frac{4}{9}$ A.
Ans. 274 A. 2 R. 18$\frac{46}{153}$ sq. p.

461. From $\frac{24}{35}$°, take $\frac{2}{3}$ of $\frac{1}{7}$°. Ans. 35′ 25$\frac{5}{7}$″.

462. From $\frac{18}{77}$ of a league, take $\frac{4}{5}$ of $\frac{4\frac{3}{4}}{19}$ m.
Ans. 4 fur. 0 rd. 2$\frac{2}{7}$ yd.

463. From $\frac{8}{9}$ bu., take $\frac{4}{5}$ of 2$\frac{3}{4}$ pk.
Ans. 1 pk. 2$\frac{38}{45}$ qt.

464. From $\frac{2}{3}$ of 18$\frac{3}{5}$ lb., take 5 ℥ 2$\frac{1}{7}$ ℈.
Ans. 11 lb. 11 ℥ 5 ʒ 2 ℈ 1$\frac{1}{7}$ gr.

465. Subtract £17 10*s.* 8$\frac{1}{3}$. from £91 6*s.* 6$\frac{1}{2}$*d.*
Ans. £73 15*s.* 10$\frac{1}{6}$*d.*

466. Take 13 tons, 3 cwt. 3 qr. 14$\frac{1}{8}$ lb. from 19 tons 1 cwt. 3 qr. 17$\frac{1}{7}$ lb. Ans. 5 T. 18 cwt. 0 qr. 3$\frac{1}{56}$ lb.

467. From 18 m. 1 fur. 13 rd. 3$\frac{1}{4}$ yd. take 7 fur. 11 rd. 4$\frac{2}{5}$ yd. Ans. 17 m. 2. fur. 1 rd. 4$\frac{7}{20}$ yd.

468. From 18 yd. 2 qr. 1$\frac{1}{9}$ na. take 2 yd. 1 qr. 2 na. 1$\frac{3}{7}$ in. Ans. 16 yd. 0 qr. 2 na. 1$\frac{1}{14}$ in.

469. What is the difference between $\frac{1}{4}$ of 15 bu. 3 pk. 4$\frac{1}{2}$ qt. and $\frac{1}{5}$ of 19 bushels? Ans. 5$\frac{21}{40}$ qt.

470. From 5 deg. 13 m. 6 fur. $14\frac{7}{8}$ rd. take 13 m. 7 fur. 13 rd. 4 yd. $2\frac{4}{5}$ ft.
Ans. 5 deg. 69 m. 3 fur 5 yd. $1\frac{11}{80}$ ft.

MULTIPLICATION OF DENOMINATE NUMBERS.

Art. 150. To multiply a denominate number by a fraction,

Rule.—*Multiply the given denominate number by the numerator of the fraction, and divide the product by the denominator.*

Note.—If the multiplier is a mixed number, reduce it to an improper fraction; if compound or complex, reduce it to a simple fraction.

471. Multiply £13 15*s.* 9*d.* by $3\frac{2}{3}$.
Ans. £50 11*s.* 1*d.*

472. Multiply £154 13*s.* $4\frac{1}{2}$*d.* by $15\frac{2}{7}$.
Ans. £2364 4*s.* $5\frac{5}{14}$ *d.*

473. Multiply 13 lb. 11 oz. 15 dwt. $16\frac{3}{4}$ gr. by $5\frac{7}{8}$.
Ans. 82 lb. 1 oz. 14 dwt. $17\frac{13}{32}$ gr.

474. Multiply 5 ton 19 cwt. 1 qr. 15 lb. by $9\frac{1}{10}$.
Ans. 54 T. 6 cwt. 2 qr. 4 lb.

475. What is $\frac{7}{100}$ of 94 lb. 2 ℥ 1 ʒ 15 gr.
Ans. 6 lb. 7 ℥ 2 ℈ $13\frac{1}{4}$ gr.

476. What is $\frac{1}{8}$ of 31 yd. 2 qr. 1 na. 2 in.
Ans. 3 yd. 3 qr. 3 na. $0\frac{7}{32}$ in.

477. What is $\frac{37}{100}$ of 17 m. 3 fur. 8 p. $2\frac{1}{5}$ yd.
Ans. 6 m. 3 fur. 20 p. $1\frac{347}{500}$ yd.

478. Multiply 78 A. 3 R. 15 sq. p. 15 sq. yd. by $15\frac{2}{3}$
Ans. 1235 A. 1 R. 2 sq. p. $23\frac{1}{4}$ sq. yd.

479. Multiply 113 sol. yd. 22 sol. ft. 1300 sol. in. by $33\frac{1}{3}$.
Ans. 3794 sol. yd. 20 sol. ft. $709\frac{1}{3}$.

480. Multiply 55 bu. 3 pk. $5\frac{2}{3}$ qts. by $66\frac{2}{3}$.
Ans. 3728 bu. 1 pk. $7\frac{1}{9}$ qt.

481 Multiply 175 da. 13 hr. $22\frac{2}{5}$ min. by $11\frac{1}{9}$.
Ans. 1950 da. 15 hr. $15\frac{5}{9}$ min.

DIVISION OF DENOMINATE NUMBERS.

Art. 151. To divide a mixed denominate number by a fraction,

Rule.—*Multiply the given denominate number by the fraction inverted.*

482. Divide 3*s*. 8*d*. by $\frac{2}{3}$. Ans. 5*s*. 6*d*.

483. Divide £15 10*s*. $8\frac{1}{2}$*d*. by $\frac{7}{8}$.
Ans. £17 15*s*. $1\frac{1}{7}$*d*.

484. Divide 49 bu. 3 pk. 1 qt. by $\frac{4}{5}$.
Ans. 62 bu. 0 pk. $7\frac{1}{4}$ qt.

485. Divide 16 m. 5 fur. $18\frac{1}{2}$ p. by $\frac{9}{10}$.
Ans. 18 m. 4 fur. $11\frac{2}{3}$ p.

486. Divide 31 yd. 1 qr. $3\frac{1}{3}$ na. by $\frac{7}{12}$.
Ans. 53 yd. 3 qr. $2\frac{6}{7}$ na.

487. Divide 67 yd. 1 ft. $6\frac{1}{4}$ in by $\frac{3}{5}$.
Ans. 112 yd. 1 ft. $6\frac{5}{12}$ in.

488. Divide £33 9*s*. $8\frac{3}{4}$*d*. by $3\frac{1}{5}$.
Ans. £10 9*s*. $3\frac{31}{64}$*d*.

489. Divide 14 lb. 11 oz. 15 dwt. 15 gr. by $5\frac{1}{2}$.
Ans. 2 lb. 8 oz. 13 cwt. 18 gr.

490. Divide 12 tons 13 cwt. 1 qr. 15 lb. by $16\frac{2}{3}$.
Ans 15 cwt. 0 qr. $20\frac{2}{5}$ lb.

491. Divide 121 lb. 3 ℥ 2 ʒ 1 ℈ 4 gr. by $13\frac{3}{4}$.
Ans. 8 lb. 9 ℥ 6 ʒ 2 ℈ $3\frac{1}{5}$ gr.

492. Divide 17 yd. 3 qr. $1\frac{1}{3}$ na. $7\frac{1}{2}$.
Ans. 2 yd. 1 qr. $2\frac{2}{45}$ na.

493. Divide 1555 m. 3 fur. 15 p. 3 yd. by $3\frac{7}{20}$.
Ans. 464 m. 2 fur. 17 rd. $4\frac{35}{134}$ yd.

494. Divide 729 A. 3 R. 15 sq. p. 25 sq. yd. by $5\frac{3}{4}$.
Ans. 126 A. 3 R. 28 sq. p. $25\frac{9}{23}$ sq. yd.

495. Divide 341 cu. yd. 17 cu. ft. 1500 cu. in. by $37\frac{1}{2}$. Ans. 9 cu. yd. 2 cu. ft. $1721\frac{23}{25}$ cu. in.

496. Divide 31 bar. 2 gal. 3 qt. $1\frac{1}{3}$ pt. by $18\frac{3}{4}$.
Ans. 1 bar. 20 gal. 2 qt. $1\frac{199}{225}$ pt.

497. Divide 15 bu. 3 pk. $1\frac{1}{5}$ qt. by $31\frac{1}{4}$.
Ans. 2 pk. $0\frac{104}{625}$ qt.

498. Divide 25 yr. 45 da. $12\frac{1}{2}$ hr by $14\frac{2}{7}$.
Ans. 1 yr. 277 da. $2\frac{39}{40}$ hr.

499. Divide 51° 13′ 15″ by $71\frac{1}{4}$. Ans. 43′ 8″.

PROMISCUOUS EXAMPLES IN DENOMINATE NUMBERS.

500. A person bought $3\frac{1}{3}$ bushels of wheat for £1 13*s.* 4*d.* per bushel, and $5\frac{1}{4}$ lb. of tea, at 9*s.* 10*d.* per lb.; what did they both cost? Ans. £8 2*s.* $8\frac{5}{6}$*d.*

501. A farmer bought 3 bu. 1 pk. 5 qt. of rye for $1; how many bushels could he buy for $$10\frac{1}{2}$?
Ans. 35 bu. 3 pk. $0\frac{1}{2}$ pt.

502. What is the sum of $\frac{4}{5}$ of 10 cwt. $3\frac{1}{2}$ qr. and $\frac{2}{3}$ of 5 tons 12 cwt. 1 qr. 4 lbs?
Ans. 4 T. 3 cwt. 2 qr. 6 lb.

503. What is the difference between $\frac{7}{8}$ of 5 sq. m. 250 A. 3 R. and $3\frac{1}{4}$ times 456 A. 3 R. 14 sq. p. 25 sq. yds? Ans. 2 sq. m. 254 A. 2 R. 26 sq. p. $24\frac{5}{8}$ sq. yd.

504. What is the sum of $\frac{7}{100}$ of 12 gal. 3 qt. $\frac{13}{100}$ of 19 gal. 3 qt. 1 pt. and $\frac{5}{100}$ of 21 gal.?
Ans. 4 gal. 2 qt. $0\frac{14}{100}$ pt.

NOTE.—In the following examples, reduce the given denominate numbers to a denomination, of which the value of a unit is given.

505. If 1 hhd. of molasses cost £4 16*s.* 8*d.*, what will $12\frac{1}{2}$ hhd. cost? Ans. £60 8*s.* 4*d.*

506. What is the price of 13 cwt. 3 qr. 15 lb. of sugar, at \$$7\frac{3}{8}$ per cent.? Ans. \$$102.51\frac{1}{4}$.

507. What is the price 16 bu. 3 pk. 2 qt. of meal at $47\frac{1}{2}$ cts. per bushel? Ans. \$$7.98\frac{19}{32}$.

508. What is the price of 17 T. 15 cwt. $3\frac{1}{2}$ qr. of iron at $3\frac{3}{8}$ per cwt.? Ans. \$$1201\frac{5}{64}$.

509. What is the price of 74 yd. 3 qr. $2\frac{1}{2}$ na. of cloth at £$1\frac{1}{3}$ per yd.? Ans. £99 17*s.* 6*d.*

510. If a person sell 29 gal. 3 qt. 1 pt. of wine at \$$2\frac{5}{9}$ per gallon, what will he sell the whole for?
Ans. \$$76.34\frac{13}{18}$.

511. If 12 lb. 3 oz. 15 dwt. 6 gr. of gold will bring \$$16\frac{3}{4}$ an ounce, how much will the whole come to?
Ans. \$$2475.021\frac{7}{8}$.

512. If 1 acre of land cost £14 12*s.* 10*d.*, what will $31\frac{1}{5}$ acres cost? Ans. £456 16*s.* $4\frac{4}{5}$*d.*

513. If 3 bushels cost £13 11*s.* 10*d.*, what will $17\frac{2}{3}$ bushels cost? Ans. £80 0*s.* $9\frac{5}{9}$*d.*

514. If 10 acres cost £489 13*s.* 11*d.*, what will $71\frac{1}{2}$ acres cost? Ans. £3501 6*s.* $6\frac{1}{20}$*d.*

515. If $10\frac{2}{3}$ lb. of tea cost £4 10*s.* 4*d.*, and $4\frac{1}{4}$ lb. cost £1 17*s.* 6*d.*, what will be the price of one pound of the mixture? Ans. 8*s.* $6\frac{150}{179}$*d.*

516. A grocer mixed sugar worth \$$7.71\frac{1}{2}$ per cwt., with an equal quantity of sugar worth \$$9.31\frac{1}{4}$ per cwt., what is the price of 7 cwt. of the mixture?
Ans. \$$59.59\frac{5}{8}$.

517. A merchant bought $5\frac{1}{2}$ barrels of pork at £1 19*s.* $2\frac{1}{2}$*d.* per barrel; $18\frac{1}{4}$ barrels of beef at £2 1*s.* $3\frac{1}{2}$*d.* per barrel, and $12\frac{1}{3}$ barrels of fish at 19*s.* $5\frac{1}{2}$*d.* per barrel; what did they all cost? Ans. £60 8*s.* $11\frac{3}{8}$*d.*

518. If one acre of ground cost £17¾, New York currency, how many dollars will 12 A. 2 R. 20 sq. p. cost?

Ans. $560.23.

519. Received from Lowell, a piece of muslin, containing 43¼ yd., and marked to be sold at 1*s.* 6*d.* a yard, New England currency; how much New York currency a yard is the muslin, and what is the value of the whole in Federal money?

Ans. { 2*s.* a yard.
{ $10.81¼ total value.

520. Received from Philadelphia, 4 pieces of cloth, each piece 39¾ yd., and marked £1 7*s.* 6*d.* a yard; how much a yard, New York currency will that be, and what will be the total value in Federal money?

Ans. { £2 a yard
{ $795 total value.

521. If wheat cost £1½, New York currency a bushel, how many bushels may be bought for $108.281¼?

Ans. 28 bu. 3 pk. 4 qt.

DECIMAL FRACTIONS.

ART. 152. What is a Decimal Fraction?

It is a fraction whose denominator is a unit with as many ciphers annexed as there are places of figures in the numerator.

ART. 153. How are decimal fractions written?

They are written like whole numbers, having a point to the left of those figures that compose the decimal, the denominator being understood.

ART. 154. Why can they be written like whole numbers?

Because, from the nature of their denominators they follow the same law, that is, they decrease in a tenfold ratio to the right, and increase in the same ratio to the left.

ART. 155. What is the first figure to the right of the point called?

Tenths.

ART. 156. What are the succeeding ones called?

The second is called hundredths, the third, thousandths, the fourth, ten thousandths, &c.

ART. 157. What effect is produced on the value of a decimal by annexing ciphers?

There is no effect produced.

ART. 158. Why?

Because when a cipher is annexed to a decimal, there must be one annexed to the denominator understood, which increases both numerator and denominator in a ten-fold ratio, and therefore does not alter the value of the fraction.

NOTE.—For a like reason when the ciphers are rejected from the right of a decimal fraction, there is no alteration in the value of that fraction.

Art. 159. What effect is produced on the value of a decimal by prefixing ciphers?

It decreases the value in a ten-fold ratio for each cipher prefixed.

Art. 160. Why?

Because when a cipher is prefixed to a decimal there must be one annexed to the denominator understood, a process which without altering the value of the numerator, increases the value of the denominator ten-fold, and therefore decreases the value of the fraction ten-fold.

Art. 161. To reduce a decimal into a vulgar fraction.

Rule.—*Under the decimal fraction place its denominator, and reduce the vulgar fraction thus formed to its lowest terms.*

1. Reduce .1 to a vulgar fraction. Ans. $\frac{1}{10}$.
2. Reduce .2 to a vulgar fraction. Ans. $\frac{1}{5}$.
3. Reduce .3 to a vulgar fraction. Ans. $\frac{3}{10}$.
4. Reduce .4 to a vulgar fraction. Ans. $\frac{2}{5}$.
5. Reduce .5 to a vulgar fraction. Ans. $\frac{1}{2}$.
6. Reduce .25 to a vulgar fraction. Ans. $\frac{1}{4}$.
7. Reduce .35 to a vulgar fraction. Ans. $\frac{7}{20}$.
8. Reduce .40 to a vulgar fraction. Ans. $\frac{2}{5}$.
9. Reduce .50 to a vulgar fraction. Ans. $\frac{1}{2}$.
10. Reduce .01 to a vulgar fraction. Ans. $\frac{1}{100}$.
11. Reduce .075 to a vulgar fraction. Ans. $\frac{3}{40}$.
12. Reduce .005 to a vulgar fraction. Ans. $\frac{1}{200}$.
13. Reduce .0025 to a vulgar fraction. Ans. $\frac{1}{400}$.
14. Reduce .8015 to a vulgar fraction. Ans. $\frac{1603}{2000}$.
15. Reduce .68375 to a vulgar fraction. Ans. $\frac{547}{800}$.

16. Reduce .265625 to a vulgar fraction. Ans. $\frac{17}{64}$.
17. Reduce .8$\frac{1}{3}$ to a vulgar fraction. Ans. $\frac{5}{6}$.
18. Reduce .16$\frac{2}{3}$ to a vulgar fraction. Ans. $\frac{1}{6}$.
19. Reduce .33$\frac{1}{3}$ to a vulgar fraction. Ans. $\frac{1}{3}$.
20. Reduce .43$\frac{3}{4}$ to a vulgar fraction. Ans. $\frac{7}{16}$.
21. Reduce .56$\frac{1}{4}$ to a vulgar fraction. Ans. $\frac{9}{16}$.
22. Reduce .225$\frac{3}{4}$ to a vulgar fraction. Ans. $\frac{903}{4000}$.
23. Reduce .01875 to a vulgar fraction. Ans. $\frac{3}{160}$.
24. Reduce .105 to a vulgar fraction. Ans. $\frac{21}{200}$.
25. Reduce .02 to a vulgar fraction. Ans. $\frac{1}{50}$.
26. Reduce .04 to a vulgar fraction. Ans. $\frac{1}{25}$.
27. Reduce .05 to a vulgar fraction. Ans. $\frac{1}{20}$.
28. Reduce .75 to a vulgar fraction. Ans. $\frac{3}{4}$.
29. Reduce .125 to a vulgar fraction. Ans. $\frac{1}{8}$
30. Reduce .45 to a vulgar fraction. Ans. $\frac{9}{20}$.
31. Reduce .025 to a vulgar fraction. Ans. $\frac{1}{40}$.
32. Reduce .325 to a vulgar fraction. Ans. $\frac{13}{40}$.
33. Reduce .375 to a vulgar fraction. Ans. $\frac{3}{8}$.
34. Reduce .525 to a vulgar fraction. Ans. $\frac{21}{40}$.
35. Reduce .625 to a vulgar fraction. Ans. $\frac{5}{8}$.
36. Reduce .875 to a vulgar fraction. Ans. $\frac{7}{8}$.
37. Reduce .0125 to a vulgar fraction. Ans. $\frac{1}{80}$.
38. Reduce .0375 to a vulgar fraction. Ans. $\frac{3}{80}$.

ADDITION.

ART. 162. To add decimal fractions,

RULE.—*Place the whole numbers under each other, as in simple addition, and the decimals, tenths under tenths, hundredths under hundredths, thousandths under thou-*

sandths, &c.; commence at the right hand column of decimals, and add as in simple addition, and place the point in the answer under the point in the numbers added.

Note.—In reading a mixed decimal, let the word *and* indicate the place of the point, thus 216.074, two hundred sixteen *and* seventy-five thousandths.

	(39.)	(40.)	(41.)
Add,	1.151	75.77	888.017
	13.29	1.4	672.45
	116.283	99.006	1112.7586
	9.0275	186.995	8672.048711
	.61	1.1	24.0009
	140.3615	464.271	11369.275211

(42.)	(43.)	(44.)
.375	.8	1.2
.0375	.087	.17
.00375	.626	.498
.9	.8885	8.2461
4.65	.49628	98.38659
		.008

(45.)	(46.)	(47.)
29.5	33.575	38649.25
16.75	1.082	4963.275
128.125	346.1261	386.275
14.25	59.86491	496.1375
16.875	596.30802	507.18
486.0625	49.591	29.1636
3511.775806	8.37625	9.1807
299.483	499.38572	2.008

48. Add four tenths; five and eighteen hundredths; seven hundred twenty-one, and twelve thousandths; seven hundred seventy-five thousandths; seven, and seventy-five thousandths; three, and four hundred eighty-six ten thousandths; eight thousand fifty-seven, and one hundred fifty-eight hundred thousandths.

Ans. 8794.49218.

49. Add sixteen thousandths; four hundredths; five tenths; seven thousandths; ninety-four millionths; eleven, and four hundredths ninety-nine, ten thousandths; twelve, and three hundred seventy-five ten millionths.

Ans. 23.6130315.

50. Add three thousand four hundred eleven and twenty-seven hundredths, 600 and eighty-six ten thousandths; eight millions, seven hundred ninety-five, and two hundred eighteen ten thousandths; nine hundred ninety-seven, and six hundred fifteen hundred thousandths. Ans. 8005803.30655.

51. Add 54, $33\frac{1}{3}$ thousandths, 679, $37\frac{1}{2}$ thousandths, 6073, 56 hundredths, 39045, and 649 thousandths.

Ans. $45852.279\frac{5}{6}$.

52. What is the sum of 91.003+16.4591+700.05+160.00471+900.0006+0315? Ans. 1867.54891.

53. What is the sum of 305.8675+300.008+745.68375+75.0075+6675.00911+675+1000?

Ans. 9776.57586.

54. What is the sum of 316+1569+69806+3154.6+254.08+16.098+4986+.00367?

Ans. 80101.78167.

55. What is the sum of 1886.7900675+9000.067586+27659.59632+576496.0049+9865711.909+18.75006275? Ans. 10480773.11793625.

SUBTRACTION.

Art. 163. To subtract decimal fractions,

Rule.—*Place the less number under the greater, whole numbers under each other, and the decimals, tenths under tenths, hundredths under hundredths, thousandths under thousandths, &c.; commence at the right hand and subtract as in simple subtraction, and place the point under the point; if the subtrahend contain more decimal figures than the minuend annex, or conceive to be annexed, as many ciphers to the minuend as will make the number of decimal figures in it equal to those in the subtrahend.*

	(56.)	(57.)	(58.)
From	298.789	127.334	94.86071
Take	196.493	55.827	27.861
	102.296	71.507	66.99971
	(59.)	(60.)	(61.)
	2684.11	986.444	2.867
	199.8637	98.6438	.9965
	2484.2463		
	(62.)	(63.)	(64.)
	148.21	5.5	6754.298
	99.118	4.875	24.17
	(65.)	(66.)	(67.)
	2864.271	.075	79.88623
	881.396001	.0375	78.912

(68.)	(68.)	(70.)
1936.54	8.1	45.37508
937.86101	7.011	23.36109

71. From seventeen and two hundredths, take seven and twenty-five hundredths. Ans. 9.77.

72. From six hundred sixty-one, take ninety-five and seven hundred twenty-one ten thousandths.
Ans. 565.9279.

73. From twenty-five thousand, take one and seventy seven thousandths. Ans. 24998.923.

74. From three hundred twenty thousand and forty five ten thousandths, take seventy-nine thousand eight hundred and seven and six hundred forty-nine millionths.
Ans. 240193.003851.

75. From one, take one-thousandth. Ans. .999.

76. From ten, take three-millionths.
Ans. 9.999997.

77. What is the difference between six, and sixty seven hundred thousandths? Ans. 5.99933.

MULTIPLICATION.

Art. 164. To multiply decimal fractions,

Rule.—*Multiply as in whole numbers, and point off in the product as many decimal figures as there are in both multiplier and multiplicand.*

78. Multiply .1 by .1. Ans. .01.

79. Multiply .2 by .2. Ans. 04.

80. What is the product of .01 by .1? Ans. .001.

81 Multiply .003 by .04. Ans. .00012.

82. Multiply .00014 by 1500. Ans. 21.

83. What is the product of .025 by 7000? Ans. 175.

84. Multiply 38.4 by 16.7. Ans. 641.28.

85. Multiply 275 by 4.75. Ans. 1306.25.

86. Multiply 14.25 by .375. Ans. 5.34375.

87. Multiply 78.243 by 1.025. Ans. 80.199075.

88. Multiply 146.05 by 128.6 Ans. 18782.03.

89. Multiply .34 by .075. Ans. .0255.

90. Multiply .565 by .16. Ans. .0904.

91. Multiply .0463 by .0081. Ans. .00037503.

92. Multiply 701.005 by 60.06. Ans. 42102.3603.

93. Multiply 456.05 by $3.8\frac{1}{4}$. Ans. $1744.391\frac{1}{4}$.

94. Multiply 308.25 by $.077\frac{1}{2}$. Ans. $23.88937\frac{1}{2}$.

95. Multiply $27.032\frac{7}{8}$ by 14.3. Ans. $386.5701\frac{1}{8}$.

96. Multiply 380.06 by $22\frac{4}{5}$. Ans. $8665.36\frac{4}{5}$.

97. Multiply $24.07\frac{3}{7}$ by .125. Ans. $3.00928\frac{4}{7}$.

98. Multiply 75 by $.33\frac{1}{3}$. Ans. 25.

99. Multiply 456.87 by $.066\frac{2}{3}$. Ans. 30.458.

100. Multiply 798.007 by $.008\frac{1}{3}$. Ans. $6.650058\frac{1}{3}$.

Art. 165. To multiply a decimal by 10, 100, 1000, &c.,

Rule.—*Move the decimal point as many places to the right as there are ciphers to the right of the unit of the multiplier, and annex ciphers if necessary.*

101. Multiply 375.456 by 10. Ans. 3754.56.

102. Multiply 1345.267 by 100. Ans. 134526.7.

103. Multiply .0075 by 1000. Ans. 7.5.

104. Multiply 17.5 by 100.	Ans. 1750.
105. Multiply 3.05 by 10000.	Ans. 30500.
106. Multiply 45.06 by $11\frac{1}{9}$.	Ans. $500\frac{2}{3}$.
107. Multiply 350.77 by $142\frac{6}{7}$.	Ans. 50110.
108. Multiply $7.035\frac{2}{3}$ by 100.	Ans. $703.5\frac{2}{3}$.

NOTE.—Cents are hundredths and mills thousandths of a dollar, and therefore are decimal fractions.

Since the smallest coin used in Federal Money is the cent, it is usual in actual transactions, if there be more than two decimals in the answer, to increase the cents one, when the third decimal is 5 or more, and reject all except the two decimals that represent the cents; and when the third is less than 5, to reject it and the others to the right of it; but for the present the entire answer will be set down for the sake of practice.

109. What will 44.5 gallons of oil cost at \$1.375 per gallon? Ans. \$61.1875.

110. What will .075 of an acre cost at $\$300\frac{1}{4}$ per acre? Ans. $\$22.518\frac{3}{4}$.

111. What will 75.5 yd. of muslin cost at $\$.12\frac{1}{2}$ a yard? Ans. $\$9.437\frac{1}{2}$.

112. How much will a person have to pay for 36.25 lb. of coffee at $\$.16\frac{2}{3}$ a pound?
Ans. $\$6.0416\frac{2}{3}$.

113. If one bushel of wheat cost \$3.15, what will 710.05 bu. cost? Ans. \$2236.6575.

114. If $\$37\frac{1}{2}$ will buy 1 acre of land, how much will 175.315 acres cost? Ans. $\$6574.312\frac{1}{2}$.

115. If you can buy 13.44 lb. of sugar for \$1, how many pounds can you buy for $\$17.33\frac{1}{3}$.
Ans. 232.96 lb.

116. If 1 tun of wine cost \$301.75, what will 12.3375 tuns cost? Ans. \$3722.840625.

117. The factors of a number are 31.025 and 7.31; what is the number? Ans. 226.79275.

118. A field is 35.103 rods one way, and 142.9 the other; how many square rods does it contain?
Ans. 5016.2187 sq. rd.

119. A field is 45.001 feet wide and 37.4 yards long; how many square feet does it contain?
Ans. 15147.3366 sq. ft.

DIVISION.

Art. 166. To divide decimal fractions,

Rule.—*Divide as in division of whole numbers, and point off in the quotient as many decimal figures as those in the dividend exceed those in the divisor.*

If the decimal figures in the divisor are of the same number as those in the dividend, the quotient will be a whole number.

If there be more decimal figures in the divisor than in the dividend, previous to dividing, annex as many ciphers to the dividend as will supply the deficiency, and more if necessary.

Note.—When the division is not exact, ciphers may be annexed to the dividend, and the quotient continued to any number of decimal figures; four is generally sufficient.

120. Divide 34.75 by 2.5. Ans. 13.9.
121. Divide 461.03 by 21.4. Ans. 21.5434.
122. Divide 3467.007 by 9.09. Ans. 381.4089.
123. Divide 1728.6475 by 18.75. Ans. 92.1945.
124. Divide 97481.06875 by 91.375. Ans. 1066.825.
125. Divide 341.452 by 3.025. Ans. 112.8766.
126. Divide 7551.475 by 7.222. Ans.
127. Divide 16.025 by .045. Ans. 356.1111⅑.
128. Divide .9375 by .075. Ans. 12.5.
129. Divide .0869725 by 38.04. Ans. .00228.
130. Divide .00643875 by 4.0275 Ans. .00159.
131. Divide 9322.15 by 6.275. Ans. 1485.6.

132. Divide 7231.5 by .4751. Ans. 15221.0061+.

133. Divide 480 by 3.12. Ans. 153.8461.

134. Divide 7650 by .6375. Ans. 12000.

135. Divide 9150.9 by .0885. Ans. 103400.

136. Divide 324 by 6400. Ans. 050625.

137. Divide 18 by 288. Ans. .0625.

138. Divide 23 by 14375. Ans. .0016.

139. Divide 1728.3508 by $18\frac{8}{9}$. Ans. 91.5009.

140. Divide 16711.259 by $25\frac{5}{7}$. Ans. 649.88229+.

ART. 167. To divide a decimal by 10, 100, 1000, &c.,

RULE.—*Move the decimal as many places to the left as there are ciphers to the right of the unit of the divisor, prefixing ciphers if necessary.*

141. Divide 188.475 by 10. Ans. 18.8475.

142. Divide 1936.25 by 100. Ans. $19\frac{29}{80}$.

143. Divide 812.5 by 100. Ans. $8\frac{1}{8}$.

144. Divide 1496.04 by 1000. Ans. 1.49604.

145. Divide 74.96 by 1000. Ans. .07496.

146. Divide .5 by 100. Ans. .005, or $\frac{1}{200}$.

147. Divide 41.1 by 100,000. Ans. .000411.

148. Divide 791.66 by $333\frac{1}{3}$. Ans. 2.37498.

149. Divide 675.025 by $9\frac{1}{11}$. Ans. 74.25275.

150. Divide .012 by $111\frac{1}{9}$. Ans. .000108.

151. Divide .125 by 4000. Ans. .00003125.

152. Divide .64 by 8000. Ans. .00008.

153. What is the quotient of .0186 divided by 2400? Ans. 00000775.

ART. 168. To reduce a vulgar fraction to a decimal,

RULE.—*Annex ciphers to the numerator, divide by the* *denominator, and point off the decimals in the quotient as in division of decimal fractions.*

NOTE.—When the denominator of the vulgar fraction is 2 or 5, or their multiples, the decimal fraction will come out exact.

154. Reduce $\frac{4}{5}$ to a decimal fraction. Ans. .8.

155. Reduce $\frac{7}{8}$ to a decimal fraction. Ans. .875.

156. Reduce $\frac{1}{2}$ to a decimal fraction. Ans. .5.

157. Reduce $\frac{1}{4}$ to a decimal fraction. Ans. .25.

158. Reduce $\frac{3}{4}$ to a decimal fraction. Ans. .75.

159. Reduce $\frac{3}{16}$ to a decimal fraction.
Ans. .1875.

160. Reduce $\frac{5}{8}$ to a decimal fraction. Ans. .625.

161. Reduce $\frac{9}{20}$ to a decimal fraction. Ans. .45.

162. Reduce $\frac{15}{16}$ to a decimal fraction. Ans. .9375.

163. Reduce $\frac{4}{25}$ to a decimal fraction. Ans. .16.

164. Reduce $\frac{17}{25}$ to a decimal fraction. Ans. .68.

165. Reduce $\frac{29}{50}$ to a decimal fraction. Ans. .58.

166. Reduce $\frac{1}{128}$ to a decimal fraction.
Ans. .0078125

167. Reduce $\frac{1}{32}$ to a decimal fraction. Ans. .03125.

168. Reduce $\frac{2}{125}$ to a decimal fraction.
Ans. .016.

169. Reduce $\frac{3}{4000}$ to a decimal fraction.
Ans. .00075.

170. Reduce $\frac{2}{3}$ of $\frac{1}{25}$ of $1\frac{1}{2}$ to a decimal fraction.
Ans. .04.

171. Reduce $\frac{9}{10}$ of $7\frac{1}{8}$ of $\frac{11}{12}$ to a decimal fraction.
Ans. 5.8109375.

172. Reduce $\dfrac{6\frac{3}{8}}{12}$ to a decimal fraction.

Ans. 53125.

173. Reduce $\frac{3\frac{1}{4}}{10\frac{2}{5}}$ to a decimal fraction.

Ans. .3125.

174. Reduce $\frac{1\frac{4}{5}}{31\frac{1}{4}}$ to a decimal fraction.

Ans. .0576.

175. Reduce $\frac{3.5}{50}$ to a decimal fractions. Ans. .07.

176. Reduce $\frac{1.65}{64}$ to a decimal fraction.

Ans. .02578125.

Art. 169. What are repeating decimal fractions?

They are decimal fractions having the same figures continually repeated.

Art. 170. From what do they arise?

They arise from changing into decimal fractions, those simple vulgar fractions whose denominators are prime numbers or multiples of prime numbers, and whose terms are prime to each other.

Note.—There are two exceptions to this, viz., when the denominators are 2 and 5.

The figure or figures repeated are called the *repetend.*

For abbreviation in writing repeated decimal fractions, a single point placed over a figure indicates that the figure is to be continually repeated.

When there is a series of two or more figures, two points, one placed over the first and the other over the last figure, indicate that the series is to be continually repeated.

177. Reduce $\frac{1}{3}$ to a decimal fraction.

Ans. .333333+or $.\dot{3}$.

178. Reduce $\frac{2}{3}$ to a decimal fraction.

Ans. .666666+or $\dot{6}$.

179. Reduce $\frac{4}{9}$ to a decimal fraction. Ans. $.\dot{4}$.

180. Reduce $\frac{7}{9}$ to a decimal fraction. Ans. $.\dot{7}$.

181. Reduce $\frac{4}{11}$ to a decimal fraction.
Ans. .363636+or $.\dot{3}\dot{6}$.

182. Reduce $\frac{5}{33}$ to a decimal fraction. Ans. $\dot{1}\dot{5}$.

183. Reduce $\frac{19}{37}$ to a decimal fraction.
Ans. 513513+or $.\dot{5}1\dot{3}$.

184. Reduce $\frac{65}{101}$ to a decimal fraction.
Ans. .64356435+or $.\dot{6}43\dot{5}$.

185. Reduce $\frac{1}{7}$ to a decimal fraction.
Ans. $.\dot{1}4285\dot{7}$.

186. Reduce $\frac{5}{13}$ to a decimal fraction.
Ans. $.\dot{3}8461\dot{5}$.

187. Reduce $\frac{5}{12}$ to a decimal fraction.
Ans. .416666+or $.41\dot{6}$.

188. Reduce $\frac{7}{24}$ to a decimal fraction.
Ans. $.291\dot{6}$.

189. Reduce $\frac{1}{22}$ to a decimal fraction. Ans. $.0\dot{4}\dot{5}$.

190. Reduce $\frac{123}{1100}$ to a decimal fraction.
Ans. $.11\dot{1}\dot{8}$.

191. Reduce $\dfrac{10\frac{4}{5}}{20\frac{1}{4}}$ to a decimal fraction.
Ans. $.5\dot{3}$.

Art. 171. To reduce a repeating decimal fraction to a vulgar fraction,

Rule.—*Write as many 9's under the repetend as there are figures in the repetend.*

192. Reduce $.\dot{5}$ to a vulgar fraction. Ans. $\frac{5}{9}$.

193. Reduce $.\dot{6}$ to a vulgar fraction. Ans. $\frac{2}{3}$.

194. Reduce $.2\dot{7}$ to a vulgar fraction. Ans. $\frac{3}{11}$.

195. Reduce $.\dot{0}3\dot{6}$ to a vulgar fraction. Ans. $\frac{4}{111}$.

196. Reduce 7227 to a vulgar fraction. Ans. $\frac{73}{101}$.

197. Reduce $.2\dot{3}$ to a vulgar fraction.
Ans. $.2\frac{1}{3}$ or $\frac{7}{30}$.

198. Reduce $.41\dot{6}$ to a vulgar fraction. Ans. $\frac{5}{12}$.

199. Reduce $23\dot{5}\dot{4}$ to a vulgar fraction.
Ans. $\frac{259}{1100}$.

200. Reduce $.06\dot{6}0\dot{3}$ to a vulgar fraction.
Ans. $\frac{733}{11100}$.

201. Reduce $.\dot{4}2857\dot{1}$ to a vulgar fraction.
Ans. $\frac{3}{7}$.

202. Reduce $.\dot{0}7602\dot{3}$ to a vulgar fraction.
Ans. $\frac{1}{13}$.

NOTE.—Addition, subtraction, multiplication and division may be performed upon repeating decimal fractions by reducing them to equivalent vulgar fractions; in the first three rules the error will be but small, if they are carried out to five or six decimal figures and then operated upon. But when a repeating decimal fraction is a divisor, the repetend should be reduced to an equivalent vulgar fraction; for then the error in the quotient is very sensible.

When the number of articles and their value are known, how can the price of a single article be found? (Art. 53.)

When the value of a single article and the value of several articles are known, how can the number of articles be found? (Ar. 54.)

NOTE.—The divisor and dividend must be of the same denomination, except when the value of a single article is to be found.

203. If 17 lb. of tea cost £12.375, what will one pound cost? Ans. £.7279.+

204. If 20 bushels of wheat cost $18.542, what will one bushel cost? Ans. $.9271.

205. If a man can earn $500 in 13.125 weeks, how much can he earn in one week? Ans. $38.095.+

206. If flour cost $5.75 per barrel, how many barrels can be bought for $1035? Ans. 180 barrels.

207. If 100 pounds of sugar cost $7.25, what will one pound cost? Ans. $.0725.

208. If 1000 acres of land cost 175861.04. what will one acre cost? Ans. $175.86104.

209. If one acre cost $500, how many acres can be bought for $3785.455? Ans. 7.57091 acres.

210. If the freight of 257.5 lb. be $1,what will be the freight on a ton? Ans. $7.767.

211. If 2¾ lb. of tea cost $1, how much will 3 cwt. 1 qr. 15.5 lb. cost? Ans. $123.818.

212. At 1⅓ shillings per gallon, how many gallons can be bought for £37. 15.75*s*? Ans. 566.8125 gal.

213. If 75.0325 cords of wood cost $600, what will one cord cost? Ans. 7.9965.

214. If 19.75 yards of cloth cost $83.25, how much will one yard cost? Ans. $4.215.

PROMISCUOUS EXAMPLES.

215. If a horse cost $175.31¼, a wagon $59.875, and the harness $12¾, to what will the whole amount? Ans. $247.9375.

216. If a person have $152½, and should loose $75.625, how much would he have left? Ans. 76.875.

217. A person earned $14.66⅔ a-day, for 31.5 days; how much did he earn altogether? Ans. $462.

218. If one yard of cloth cost $4.50, what will 7.125 yards cost? Ans. 32.0625.

219. If one bushel of wheat cost $.9375, what will 28 bushels cost? Ans. $26.25.

220. For one dollar a boy bought 250 apples; how many would that be for $6.64? Ans. 1660 apples.

221. If 3 barrels of flour cost $10.125, what will 100 barrels cost? Ans. $337.50.

222. If 5.1 acre cost $1501.35, what will 10 acres cost? Ans. $2943.82.

223. If 4 bottles of equal size contain 5.805 pints, how much will 1000 bottles contain? Ans. 1451.25 pt.

224. 25 barrels of beer cost £64.0625; how much will 14.48 barrels cost? Ans. £37.105.

225. If 1000 bushels of rye cost \$250, what will 2.5 bushels cost? Ans. \$.625.

226. If 10 tons of hay cost \$42.625, what will 38.4 tons cost? Ans. \$163.68.

227. If 100 head of cattle cost \$7211.50, what will one cost? Ans. 72.115.

228. If 7.5 yd. of muslin cost 15 shillings, how many yards can be bought for £13.448? Ans. 134.48 yd.

229. If 120.06 bushels of potatoes are raised upon 3 acres of land, how many acres would it take to raise 4580.64 bushels? Ans. 114.458 acres.

230. If one ounce of gold be worth \$18.42, how much will \$38575.875 worth of gold weigh?
Ans. 2094.238 oz.+

231. If .65 of a pound of sugar cost \$.08125, how many pounds can be bought for \$100? Ans. 800 lb.

232. If a man can travel 32.445 miles in ⅞ of a day, how far can he travel in 365¼ days? Ans. 13543.47

233. A boy can earn 1.71875 shillings in 2.5 days; how much can he earn in 12.32 days? Ans. 8.47*s*.

234. What will 36.48 yards of cloth cost, when 14.25 yards cost \$21.375? Ans. \$54.72.

235. If 2 lb. of sugar cost \$.1875, what will 10 lb. cost? Ans. \$.9375.

236. If 3.25 yd. cost \$15.375, how much will 100 yd. cost? Ans. \$473.07 9/13.

237. What is the price of 2850 shingles, at \$21.75 per thousand? Ans. \$61.98¾.

238. What will 17 cwt. 2 qr. 7.5 lb. cost, at \$6.75 per hundred pounds? Ans. \$118.63⅛.

239. If 17.05 bushels cost $13, what will 100 bushels cost? Ans. $76.24.

240. If you can buy 13¼ lb. of coffee for $2.50, how many pounds can you buy for $325.50? Ans. 1724 17/20 lb.

241. If 100 chaldrons of coal cost £12.375, what will 38.25 chaldron cost? Ans. £4.7334.

242. How many yards of muslin can be bought for £19 10*s.* 6*d.*, at 9.5*d.* for 2.375 yards? Ans. 1171½ yd.

REDUCTION.

ART. **172.** To reduce a denominate decimal from a higher to a lower denomination,

RULE.—*Multiply the given denominate decimal by as many of the denomination next lower as will make a unit of the given denomination; multiply this result as before, and so proceed until the decimal is reduced to the denomination required.*

NOTE.—In the course of the operation, the products may be kept entire, or so each product the whole number may be reserved and the decimal portion be multiplied; at the end, collect all the whole numbers, commencing at the highest denomination, and arrange them in a horizontal row with the last decimal annexed to the lowest denomination.

243. Reduce .3475 £ to pence. Ans. 83.4*d.* or, 6*s.* 11.4*d.*

244. Reduce .9375 lb. to grains, Troy Weight. Ans. 5400 gr. or, 11 oz. 5 dwt.

245. Reduce .11875 tons to pounds. Ans. 237.5 lb. or, 2 cwts. 1 qr. 12 lb. 8 oz.

246. Reduce .9995 lb. Apothecaries' weight to grains. Ans. 5757.12 gr. or, 11 ℥ 7 ʒ 2 ℈ 17.12 gr.

247. Reduce .5725 yd. to inches, cloth measure. Ans. 20.61 in. or, 2 qr. 1 na. 0.36 in.

248. Reduce .90125 m. to poles.
Ans. 288.4 p. or, 7 fur. 8.4 p.

249. Reduce .04925 m. to feet.
Ans. 260.04 ft. or, 15 p. 4 yd. 0.54 ft.

250. Reduce .0175 A. to its value in lower denominations. Ans. 2 sq. p. 24 sq. yd. 1.8 sq. ft.

251. Reduce .00525 cu. ft. to inches.
Ans. 9.072 cu. in.

252. Reduce 5.125 hhd. to its value in lower denominations. Ans. 5 hhd. 7 gal. 3 qt. 1 pt.

253. Reduce 3.2225 chaldrons to its value in lower denominations. Ans. 3 ch. 7 bu. 0 pk. 3.84 qt.

254. Reduce .7725 wk. to its value in lower denominations. Ans. 5 da. 9 hr. 46 min. .48 sec.

255. Reduce 3.4629° to its value in lower denominations. Ans. 3° 27′ 46.44″.

ART. **173.** To reduce a denominate number to the decimal of a higher denomination,

RULE.—*If necessary, annex ciphers to the given denominate number and divide by as many of its own denomination as it takes to make a unit of the next higher, and so proceed until the number is reduced to the denomination required, the quotients being carried out as in division of decimals.*

256. Reduce 3*d*. to the decimal of a shilling.
Ans. .25*s*.

257. Reduce 1½*d*. to the decimal of a shilling.
Ans. .125*s*.

258. Reduce 6 gr. to the decimal of an ounce.
Ans. .0125 oz.

259. Reduce 3 oz. to the decimal of pound Troy.
Ans. .25 lb.

260. Reduce 8 dr. to the decimal of a pound Avoirdupois. Ans. .03125 lb.

261. Reduce 25 lb. to the decimal of a ton.
Ans. .0125 T.

262. Reduce $3\frac{1}{4}$ ℥ to the decimal of a pound.
Ans. .27083 lb.

263. Reduce 3.25 na. to the decimal of a yard.
Ans. .203125 yd.

264. Reduce 4.0125 feet to the decimal of a rod.
Ans. $.243\dot{1}\dot{8}$ ft.

265. Reduce $8\frac{3}{4}$ feet to the decimal of a furlong.
Ans. $.0132\dot{5}\dot{7}$ fur.

266. Reduce $\frac{7}{11}$ sq. ft. to the decimal of a square yard. Ans. $.\dot{0}\dot{7}$ sq. yd.

267. Reduce 45 sq. yd. to the decimal of an acre.
Ans. .009297 A.

268. Reduce $2\frac{1}{3}$ pt. to the decimal of a gallon.
Ans. $.291\dot{6}$ gal.

269. Reduce .45 pk. to the decimal of a bushel.
Ans. .1125.

270. Reduce $12\frac{3}{8}$ days to the decimal of a year of $365\frac{1}{4}$ days. Ans. .03388 yr.

271. Reduce $3\frac{3}{4}$ ft. to the decimal of a fathom.
Ans. .625 of a fathom.

272. Reduce 9 sheets to the decimal of a ream.
Ans. .01875 of a ream.

273. Reduce 75.125 lb. to the decimal of a barrel of pork. Ans. .375625 bbl.

274. Reduce 21 inches to the decimal of a mile.
Ans. .0003314 m.

REDUCTION OF DENOMINATE NUMBERS.

ART. 174. To reduce denominate numbers containing several denominations, to a decimal,

RULE.—*Commence at the lowest denomination and reduce it to the decimal of the next higher, and to this decimal prefix the next higher denomination as a whole number, reduce this to the decimal of the next higher denomination and prefix the next higher denomination; so proceed till the number is brought to the decimal required.*

275. Reduce 3*s.* 6*d.* to the decimal of a pound.
Ans. £.175.

276. Reduce £14 17*s.* 3*d.* to the decimal of a pound.
Ans. £14.8625.

277. Reduce 5 oz. 13 dwt. 12 gr. to the decimal of a pound. Ans. .472916̇ lb.

278. Reduce 15 cwt. 3 qr. 2½ lb. to the decimal of a ton. Ans. .78875 T.

279. Reduce 156 lb. 4 ℥ 1 ʒ 1 ℈ 10 gr. to the decimal of a pound. Ans. 156.3489583̇.

280. Reduce 3 qr. 1 na. 1⅛ in. to the decimal of an E. E. Ans. .675 E. E.

281. Reduce 7 m. 7 fur. 1 p. to the decimal of a mile?
Ans. 7.878125 m.

282. Reduce 2 fur. 13 rd. 4.4 yd. to the decimal of a league. Ans. .0977083̇.

283. Reduce 5 A. 3 R. 21 sq. p. to the decimal of an acre. Ans. 5.88125 ac.

284. Reduce 3 R. 1 sq. p. 18 sq. yd. to the decimal of an acre. Ans. .759969 ac.

285. Reduce 290 cu. in. to the decimal of a ton of round timber. Ans. .004192 T.

286. Reduce 3 qt. 1.75 pt. to the decimal of a hhd.
Ans. .015376 hhd.+

287. Reduce 14 bu. 3⅗ qt. to the decimal of a chaldron.
Ans. .4410156¼.

288. Reduce 14° 15′ 22⅕″ to the decimal of a degree.
Ans. 14.25616°.

289. Reduce 3 da. 12⅗ sec. to the decimal of a week.
Ans. .428592 wk.+

290. Reduce 1 quire 9 sheets to the decimal of a bundle.
Ans. .034375 of a bundle.

291. Reduce 15 lb. 10 oz. 8 dr. to the decimal of a ton.
Ans. .007828⅛ T.

292. Reduce 11 pounds to the decimal of a ton.
Ans. .0055 T.

293. Reduce 42 inches to the decimal of a mile.
Ans. .0006624 m.

294. Reduce 6 feet to the decimal of a mile.
Ans. .001136 m.

295. Reduce 411 sq. ft. to the decimal of an acre.
Ans. .009435+ A.

296. Reduce 75 sq. yd. to the decimal of a square mile.
Ans. .000242 sq. m.

ADDITION OF DENOMINATE NUMBERS.

Art. 175. To add denominate decimals,

Rule.—*Reduce the given quantities to the decimal of the same denomination and add as in addition of decimals*

297. Add £.25, £5, .75*s.* and .875*s.*
Ans. 16*s.* 7½*d.*

298. Add £3.125, £5.15, 3.25*s.* and 4.25*d.*
Ans. £8. 9*s.* 1¼*d.*

299. What is the sum of .33⅓ lb., .5 lb., 7.5 oz., 5.75 dwt. and 11 gr.?
Ans. 1 lb. 5 oz. 16 dwt. 5 gr.

300. What is the sum of 3.05 T., 6¼ cwt., 3.025 cwt., and 1.2 qr.? Ans. 3 T. 10 cwt. 2 qr. 7½ lb.

301. Add together .7125 m., 6.4 m., 3.75 fur., and 4.11 rd. Ans. 7 m. 4 fur. 30.11 rd.

302. Add together 13.625 A., 1.0375 A., 3.25 R., and 19.05 sq. p. Ans. 15 A. 2 R. 15.05 sq. p.

303. What is the sum of 3.33⅓ hhd., 15.5 gal., and 3.165 qt.? Ans. 3 hhd. 37 gal. 1.165 qt.

304. What is the sum of 75.02 bu., 16.625 bu., 3.47 pk., and 4.45 qt.? Ans. 92 bu. 2 pk. 4.85 qt.

305. What is the sum of 45.655 da., 33.33⅓ min., .45 min., and 16.15 sec.?
Ans. 45 da. 16 hr. 17 min. 15.15 sec.

306. Add .75 lb. Troy weight, .35 lb., .375 oz., and 2.125 oz. Ans. 1 lb. 3 oz. 14 dwt.

307. Add .375 T., .875 T., 3.125 cwt., 14.5 cwt., 15 lb., and 13.5 lb. Ans. 2 T. 2 cwt. 3 qr. 16 lb.

308. Add 145.75 lb. apothecaries' weight, .8375 lb .66⅔ ℥, 3.5 ℥, 1.33⅓ ʒ, and 19.375 gr.
Ans. 146 lb. 11 ℥ 3 ʒ 1 ℈ 3.375 gr.

309. Add 3¾ yd., 47.175 yd., 13.33⅓ yd., 4.09375 yd. and 3.116 ft. Ans. 69 yd. 1 ft. 2.067 in.

SUBTRACTION OF DENOMINATE NUMBERS.

Art. 176. To subtract denominate decimals?

Rule.—*Reduce the given quantities to the same denomination and subtract as in subtraction of decimals.*

310. From £.625 take £.4375.
Ans. £.1876 or 3*s.* 9*d.*

311. From £1.25 take 13.5575 shillings.
Ans. 11*s.* 5.31*d.*

312. From 49.375 lb. take 13.45 dwt.
Ans. 49 lb. 3 oz. 16 dwt. 13.2 gr.

313. From .37122 T. take 3 cwt. 1 qr. 15.32 lb.
Ans. 4 cwt. 0 qr. 2.12 lb.

314. From 15.375 lb. take 11.375 ℥.
Ans. 14 lb, 5 ℥ 1 ʒ.

315. From 3 yd. 3 qr. take 1 qr. 2 na. 1.25 in.
Ans. 3 yd. 1 qr. 1 na. 1 in.

316. From 41.24 degrees take 41 m. 3.25 fur.
Ans. 40 deg. 44 m. 6 fur. 7.6 rd.

317. From 45 square miles, subtract 14 sq. m. 551.125 acres. Ans. 30 sq. m. 88 A. 3 R. 20 sq. p.

318. From 15.331 cords, take 114⅓ cu. ft.
Ans. 14 cord 56 cu. ft. 59.904 cu. in.

319. From 15 bbl. 3.25 gal., take 41.365 gallons.
Ans. 14 bbl. 24 gal. 3.54 qt.

320. 115.3355 bu., take 3.451 pk.
Ans. 114 bu. 1 pk. 7.128 qt.

321. From .3120 of a year of 365¼ days, take 29 days 13.425 hr. Ans. 84 da. 9 hr. 34 min. 1.2 sec.

322. From 17.09375 A., take 14 A. 3 R. 18.65 sq. p.
Ans. 2 A. 0 R. 36 sq. p. 10.5875 sq. yd.

MULTIPLICATION OF DENOMINATE NUMBERS.

ART. 177. To multiply denominate numbers by a decimal fraction,

RULE.—*Reduce the given denominate number to the decimal of the highest denomination, and multiply it by the multiplier. Or,*

Reduce the multiplier to a vulgar fraction; divide the given denominate number by the denominator, and multiply the quotient by the numerator.

323. Multiply £13 10*s*. by .5.
Ans. £6.75 or, £6 15*s*.

324. Multiply £38 15*s.* 9*d.* by .15.
Ans. £5 16*s.* $4\frac{7}{20}$*d.*

325. Multiply 14 lb. 3 oz. 11 dwt. 15 gr. by .13.
Ans. 1 lb. 10 oz. 6 dwt. 2.67 gr.

326. What is .25 of 50 T. 15 cwt. 3 qr. 15 lb.?
Ans. 12 T. 13 cwt. 3 qr. 22.5 lb.

327. What is .47 of 15 lb. 3 ℥ 4 ʒ 1 ℈ ?
Ans. 7lb. 2 ℥ 2 ʒ 0 ℈ 7 gr.

328. What is .10 of 4 E. Fr. 1 qr. 3 na. 1.25 in.?
Ans. 2 qr. 2 na. 0.8 in.

329. Multiply 73 m. 4 fur. 3¾ rd. by 1.25.
Ans. 91. m. 7 fur. 4.6875 rd.

330. Multiply 14 A. 3 R. 25 sq. p. by .09.
Ans. 1 A. 1 R. 14 sq. p. 19.6625 sq. yd.

331. Multiply 41 gal. 1 qt. 1.75 pt. by .125.
Ans. 5 gal. 0 qt. 1 pt. 1.875 gi.

NOTE.—Reduce the following sums to the decimal of that denomination of which the value of a unit is given.

332. What cost 3 cwt. 2 qr. of sugar at $11.25 per cwt.? Ans. $39.37½.

333. What will 15 T. 15 cwt. 35 lb. of iron cost at $56.25 per ton? Ans. $886.92.

334. If a bushel of oats cost $.78, what will 59 bu. 3 pk. 5 qt. cost? Ans. $46.73.

335. If a man can earn £2 13*s.* 4*d.* in one day, how much can he earn in 3.5 days? Ans. £9 6*s.* 8*d.*

336. If an acre cost $175.25, what will 71 A. 3 R 2.5 sq. p. cost? Ans. $12576.92.

337. What will be the price 12 T. 13 cwt. 1 qr. 10.5 lb. of sugar at $12.50 per cwt.? Ans. $3166.94.

338. What will be the cost of 71 yd. 3 qr. 3 na. of cloth, at $5.87½ per yard? Ans. $422.63.

339. What will 14 cwt. 3 qr. 16 lb. of iron cost, at $73.16 a ton? Ans. $54.54.

340. What will 9 oz. 13 dwt. 8 gr. of gold cost, at $212.38 a pound? Ans. $171.08.

341. If one acre of land cost £37.15*s*., what will 15 A. 1 R. 10 sq. p. cost? Ans. £578 0*s*. 11¼*d*.

342. If a ton of copper cost £63 17*s*. 3*d*., what will 7 T. 13 cwt. 3 qr. 16 lb. cost? Ans. £491 9*s*. 0¾*d*.

DIVISION OF DENOMINATE NUMBERS.

ART. 178. To divide a mixed denominate number by a decimal fraction,

RULE.—*Reduce the given denominate number to the decimal of the highest denomination and divide it by the divisor. Or,*

Divide the given denominate number by the divisor, considered as a whole number, and multiply the quotient by the number that expresses the order of the decimal.

343. Divide £591 15*s*. 9*d*. by 1.5.
Ans. £394 10*s*. 6*d*.

344. Divide £5 19*s*. 11¾*d*. by .25.
Ans. £23. 19*s*. 11*d*.

345. Divide 171 lb. 3 oz. 15 dwt. 21 gr. by 3.15.
Ans. 54 lb. 4 oz. 12 dwt. $15\frac{17}{21}$ gr.

346. Divide 3 cwt. 1 qr. 15 lb. 12 oz. 9 dr. by .875.
Ans. 3 cwt. 3 qr. 14 lb. 7 oz. 8 dr.

347. Divide 501 lb. 3 ℥ 5 ʒ 1 ℈ 16 gr. by 17.05.
Ans. 29 lb. 4 ℥ 6 ʒ 1 ℈ 17 gr.

348. Divide 71 E.E. 3 qr. 1 na. 1 in. by 6.25.
Ans. 11 E.E. 2 qr. 1 na. .079 in.

349. Divide 34 deg. 29 m. 3 fur. 21 rd. by .05.
Ans. 688 deg. 32 m. 6 fur. 20 rd.

350. Divide 61 sq. m. 543 A. 1 R. 20 sq. p. by .31¼.
Ans. 197 sq. m. 586 A. 3. R. 8 sq. p.

351. Divide 59 cu. yd. 14 cu. ft. 1500 cu. in. by .75.
Ans. 79 cu. yd. 10 cu. ft. 1424 cu. in.

352. Divide 13 hhd. 51 gal. 1 qt. 1.75 gi. by 3.75.
Ans. 3 hhd. 43 gal. 2.6 gi.

353. Divide 1 bu. 3 pk. 4.5 qt. by .025.
Ans. 75 bu. 2 pk. 4 qt.

When the number of articles and their value are known, how can the value of a single article be found? (Art. 53.)

When the value of a single article and the value of several articles are known, how can the number of articles be found? (Art. 54.)

NOTE.—The divisor and dividend must be of the same denomination, except when the value of a single article is to be found.

354. If 3.1 gallons of molasses cost $.93, what will one gallon cost? Ans. $.30.

355. If 7.5 bushels of rye cost $1.98, what will one bushel cost? Ans. $.264.

356. If 4.9 lb. of tea cost £1. 18*s.* 9.5*d.*, what will one pound cost? Ans. 7*s.* 11*d.*

357. If 13 cwt. 3 qr. 15 lb. of sugar be put in parcels of 12.5 lb. each, how many parcels will there be?
Ans. 111.2 parcels.

358. If 17.5 acres of land cost £4861. 14*s.* 4½*d*, what will one acre cost? Ans. £277. 16*s.* 3*d.*

359. If 3 yd. 1 qr. cost $14.75, what will one yard cost? Ans. $4.5383+.

360. If you can buy 15 cwt. 2 qr. 14 lb. of tobacco for $100, how much will one hundred weight cost?
Ans. $6.3938+.

361. If a person travels 21.4 miles in 11 hr. 10 m. 30 sec., how long will it take him to travel one mile?
Ans. .52219 hr., or 31 min. 20 sec.

362. If 33 gal. 2 qt. 1.5 pt. cost $124.25, what will one gallon cost? Ans. $3.688+.

363. If 14 bu. 1 pk. 7 qt. cost $18.50, how many bushels may be bought for $1?
Ans. .78209 bu.+or 3 pk. 1 qt.

364. If a yard of silk cost 17*s.* 4½*d.*, how many yards can be bought for £251. 15*s.* 6*d.*? Ans. 289 $\frac{113}{139}$ yd.

365. If a barrel of flour cost $5.50, how many barrels can be bought for £79. 4*s.*, New York currency?
Ans. 36 barrels.

366. If you can buy 3 yd. 1 qr. of silk for £1, how much will 235 yd. 3 qr. 1 na. cost? £72. 11*s.* 1*d.*+.

367. If 5 bu. 1 qt. cost one dollar, how much will 654 bushels cost? Ans. $129.98+.

368. If a bottle contain 1 pt. 3.875 gills, how many bottles must be used to put up 2 tuns of wine?
Ans. 2048 bottles.

369. If 14 yd. 3 qr. 3 na. cost $57.325, what will one yard cost? Ans. $3.8377+.

370. If a person can travel 169 m. 3 fur. 24 p. in 8.125 days, how far can he travel in one day?
Ans. 20.8554 m., or 20 m. 6 fur. 33.728 rd.

PROMISCUOUS EXAMPLES—DENOMINATE NUMBERS.

371. If 8.25 yards of silk cost £3. 5*s.* 6*d.*, what will be the price of one yard? Ans. 7*s.* 11¼*d.*+

372. How much will 61 gal. 2 qt. 1 pt. of oil cost, when 3.5 gal. cost $4.375? Ans. $77.03125.

373. If 2 oz. 10 dwt. of gold cost $35.80, how much may be bought for $260.70?
Ans. 1 lb., 6 oz., 4 dwt., 24 grs.

374. How many yards of muslin may be bought for £11. 5*s.*, when 64.125 yd. cost £8.15625?
Ans. 88.4443 yd.+

375. If 18 A. 3 R. 30 sq. p. cost $4545, what will 150 acres cost? Ans. $36 000.

376. If 25.15 yards cost £12. 11*s.* 9*d.*, what will 5 yd. cost? Ans. £2. 10*s.* 0$\frac{1}{2}$*d.*

377. If 3 lb. 7 oz. 10 dwt. of silver cost £2. 17*s.* 9*d.*, what will 2.33$\frac{1}{3}$ lb. cost? Ans. £1. 17*s.* 2$\frac{2}{25}$*d.*

378. If £4. 17*s.* 6*d.* be the price of 100 lb. of cheese, how many pounds can be bought for £65$\frac{3}{8}$.
Ans. 1341.025 lb.

379. If 3 cwt. 2 qr. 15.25 lb. of sugar cost $23.50, what will 40 pounds cost? Ans. $2.5736.

380. If 16$\frac{2}{3}$ pounds of mace cost $48.375, what will 17 cwt. 1 qr. 20 lb. cost? Ans. 5064.86\frac{1}{4}$.

381. If 33$\frac{1}{3}$ bushels of peaches cost £1. 10*s.* 7*d.*, what will 180.4 bushels cost? Ans. £8. 5*s.* 6.204*d.*

382. If 1 hhd. 15.75 gallons of wine cost $150.50, what will 11$\frac{1}{3}$ gallons cost? Ans. $21.2345+.

383. If 4.5 acres cost $2400, what will 94 A. 3 R. 24 sq. p. cost? Ans. 50613.33\frac{1}{3}$.

384. If it cost 2*s.* 9$\frac{1}{2}$*d.* to cart a load of wood 1.125 miles, how much will it cost to cart 40 cords, 7 m. 7 fur., allowing 2.275 loads to a cord? Ans. £88. 18*s.* 3$\frac{1}{2}$*d.*

385. If 1.5 bushels of wheat cost 1.68\frac{3}{4}$, what will 154 bu. 1 pk. 6 qt. cost? Ans. $173.74.

386. If .98 of a yard of cloth cost $5.53, what will 7 pieces, each piece 37 yd. 2 qr. 1 na., cost?
Ans. $1483.71875.

387. If 2.6 gallons of wine cost £2. 17*s.* 9*d.*, what will 43 gal. 2 qt. cost? Ans. £48 6*s.* 2$\frac{1}{4}$*d.*

388. If a $1.\dot{4}\dot{5}$ hhd. of brandy cost £44. 13*s.* 4*d.*, what will 5 hhd. 15.75 gal. cost? Ans. £161. 4*s.* 4$\frac{1}{2}$*d.*

389. If A can do a piece of work in 2.5 days, and B can do it in 3 days, how long would it take them both together? Ans. 1$\frac{4}{11}$.

390. If A can mow 12 acres of wheat in 12.5 days, and B in 13.5 days, how long will it take the two together? Ans. $6\frac{51}{104}$ days.

391. If A and B together can consume a barrel of provisions in 16.5 days, and A can do it alone in 27.5 days, how long will it last B alone? Ans. 41.25 days.

PERCENTAGE.

Art. 179. What is Percentage?

Percentage is a certain rate on one hundred.

Art. 180. How is percentage written?

By hundreds in the form of a decimal. Thus,

1	per	cent.	is	written	.01
2	“	“	“	“	.02
7	“	“	“	“	.07
10	“	“	“	“	.10
25	“	“	“	“	.25
30	“	“	“	“	.30
$33\frac{1}{3}$	“	“	“	“	$.33\frac{1}{3}$
$37\frac{1}{2}$	“	“	“	“	$.37\frac{1}{2}$
100	“	“	“	“	1.
105	“	“	“	“	1.05
180	“	“	“	“	1.80
200	“	“	“	“	2.
250	“	“	“	“	2.50
$\frac{1}{2}$	“	“	“	“	$.00\frac{1}{2}$ or, .005
$\frac{1}{4}$	“	“	“	“	$.00\frac{1}{4}$ or, .0025
$\frac{1}{3}$	“	“	“	“	$.00\frac{1}{3}$ or, $.0033\frac{1}{3}$
$\frac{4}{5}$	“	“	“	“	$.00\frac{4}{5}$ or, .008

Art. 181. To find the per cent. of any number,

Rule.—*Multiply the given number by the rate per cent.*

1. What is 1 per cent. of $100? Ans. $1.

2. What is 1 per cent. of 250 bushels? Ans. 2½ bu.

3. What is 1 per cent. of $36.50? Ans. .365.

4. What is 1 per cent. of $1936 yd.? Ans. 19.36 yd.

5. What is 10 per cent. of $750. Ans. $75.

6. What is 10 per cent of 694 lb. of sugar? Ans. 69.4 lb.

7. What is 10 per cent. of $19.25. Ans. $1.92½.

8. What is 20 per cent. of $329.62½? Ans. $65.92½.

9. What is 12 per cent. of 20 pounds of gold, valued at $17.70 per ounce? Ans. $509.76.

10. What is 15 per cent. of 964 eggs? Ans. 144.6 eggs.

11. What is 35 per cent. of $10000? Ans. $3500.

12. What is 76 per cent. of 2654 bushels? Ans. 2017 bu. 0 pk. 1.28 qt.

13. What is 100 per cent. of $5. Ans. $5.

14. What is 33⅓ per cent. of $660? Ans. $220.

15. What is 12½ per cent. of 900 gal.? Ans. 112½ gal.

16. What is 25 per cent. of $1841.25? Ans. $460.31¼.

17. What is 37½ per cent. of £2971? Ans. £1114. 2*s.* 6*d.*

18. What is 50 per cent. of 75 hhd.? Ans. 37 hhd. 31 gal. 2 qt.

19. What is 75 per cent. of 41 sq. rods? Ans. 30 sq. rd. 22 sq. yd. 6 sq. ft. 27 sq. in.

20. What is $16\frac{2}{3}$ per cent. of 52 tons?
Ans. 8 T. 13 cwt. $1\frac{1}{3}$ qr.

21. What is 18 per cent. of 71 lb. 6 oz. 6 dwt?
Ans. 12 lb. 10 oz. 9.88 dwt.

22. What is 7 per cent. of 153 yd. 3 qr.
Ans. 10 yd. 3.05 qr.

23. What is 17 per cent. of 7 m. 3 fur. 20 p.?
Ans. 1 m. 2 fur. 4 p. 3.3 yd.

24. What is 5 per cent. of 361 A. 2 R. 17 sq. p.?
Ans. 18 A. 0 R. 12.85 sq. p.

25. What is 1 per cent. of 15 hhd. 30 gal. 3 qt. 1 pt.?
Ans. 9 gal. 3 qt. .07 pt.

26. What is 2 per cent. of 725 bu. 3 qt.?
Ans. 14 bu. 2 pk. .06 qt.

27. What is 100 per cent. of 3 yd. 2 qr. 1 na.?
Ans. 3 yd. 2 qr. 1 na.

28. What is 125 per cent. of $4725?
Ans. $5906.25.

29. What is 186 per cent. of 16 cwt. 3 qr. 11 lb?
Ans. 31 cwt. 1 qr. 10.96 lb.

30. What is 200 per cent. of $625? Ans. $1250.

31. What is 250 per cent. of £713 15*s.*?
Ans. £1784 7*s.* 6*d.*

32. What is 247 per cent. of £116?
Ans. £286 10*s.* 4.8*d.*

33. What is $8\frac{1}{3}$ per cent. of $1620? Ans. $135.

34. What is $\frac{1}{2}$ per cent. of 1000 eggs?
Ans. 5 eggs.

35. What is $\frac{3}{4}$ per cent. of 1299.33\frac{1}{3}$?
Ans. $9.745.

36. What is $\frac{7}{8}$ per cent. of £1905 10*s.*?
Ans. £16 13*s.* 5.55*d.*

37. What is $\frac{2}{3}$ per cent. of $11.43? Ans. $.0762.

38. What is $\frac{1}{10}$ per cent. of £126 1*s*. 6*d*.?
Ans. 2*s*. 6¼*d*.

39. A person had $750, and lost 12½ per cent. of it; how much did he lose? Ans. $93.75.

40. A field contains 189 acres; 33⅓ per cent. of it was sold; how much was left? Ans. 126 acres.

41. A general had an army of 5408 men; he lost 6¼ per cent of them in an engagement; how many men did he lose? Ans. 338.

42. A merchant bought 15 pieces of broadcloth, each piece containing 31¼ yards; on examination 50 per cent. proved to be damaged; how many yards of good cloth were there? Ans. 234⅜ yd.

43. A person invested $3360 in a speculation, and made 66⅔ per cent., how much money did he then have?
Ans. $5600.

44. A man bought a house for $1225.50; in the course of 2 years it increased in value 147 per cent.; how much was the house then worth?
Ans. $3026.985.

45. A lady had $76.20; she spent 7½ per cent. of it in dry goods; how much did she have left?
Ans. $70.485.

46. A person has a bill of $350 against another; he consents to deduct ⅛ per cent. for cash; how much does he receive? Ans. $349.56¼.

47. A person had $5420; he purchased goods with 37½ per cent. of it, 25 per cent. of the balance he lent to a friend; how much did he have left?
Ans. $2540.625.

Art. 182. To find what per cent. one number or quantity is of another of the same name or kind,

Rule.—*Place the given number or quantity in the numerator and the one with which it is to be compared, in* *the denominator; reduce both terms to the same denomination and then to a decimal; the first two figures to the right of the point will be the per cent. required.*

48. What per cent. is 1 of 4? Ans. .25.
49. What per cent. is 1 of 5? Ans. .20.
50. What per cent. is 2 of 10? Ans. .20.
51. What per cent. is 3 of 50? Ans. .06.
52. What per cent. is 7 of 16? Ans. .43$\frac{3}{4}$.
53. What per cent. is $\frac{3}{4}$ of 1? Ans. .75.
54. What per cent. is $\frac{2}{5}$ of 25? Ans. .01$\frac{3}{5}$.
55. What per cent. is $\frac{3}{8}$ of 100? Ans. .00$\frac{3}{8}$.
56. What per cent. is $\frac{9}{10}$ of 62$\frac{1}{2}$? Ans. .01$\frac{11}{25}$.
57. What per cent is 3.5 of 35? Ans. .10.
58. What per cent. is 7.5 of 15? Ans. 50 pr. ct.
59. What per cent. is 300 of 60?
Ans. 500 pr. ct.
60. What per cent. is 250 of 64?
Ans. 3.90$\frac{5}{8}$ pr. ct.
61. What per cent. is 2*s*. 8*d*. of £1?
Ans. 13$\frac{1}{3}$ pr. ct.
62. What per cent. is 15*s*. 9*d*. of £1?
Ans. 78$\frac{3}{4}$ pr. ct.
63. What per cent. is 3 fur. 20 rd. of one mile?
Ans. 43$\frac{3}{4}$ pr. ct.
64. What per cent. is 5 fur. 16 rd. 2$\frac{3}{4}$ yd. of one mile?
Ans. 67$\frac{21}{32}$ pr. ct.
65. What per cent. of $25 is $3.50?
Ans. 14 pr. ct.
66. What per cent. of one square mile is 154 A. 3 R 15 sq. p.?
Ans. 24$\frac{199}{1024}$ pr. ct.
67. What per cent. of 17$\frac{5}{8}$ is 3$\frac{21}{40}$?
Ans. 20 pr. ct.

68. What per cent. of 16 is $\frac{2}{3}$ of $123\frac{4}{5}$?
Ans. $515\frac{5}{6}$ pr. ct.

69. What per cent. of 18.25 is 3.375 ?
Ans. $18\frac{36}{73}$ pr. ct.

70. What per cent. of 40 is .0125 ?
Ans. .0003125 or $\frac{1}{320}$ pr. ct.

COMMISSION.

Art. 183. What is Commission ?

Commission is an allowance made to one person for buying or selling goods for another.

Art. 184. How is commission calculated ?

By a percentage.

Art. 185. To find the commission,

Rule.—*Multiply the given sum by the rate per cent.; the product will be the commission.*

1. A commission merchant sold 500 pieces of bombazine for $30 a piece; what was his commission at 2 per cent. ? Ans. $300.

2. An auctioneer sold a house for $3125; what was his commission at 1 per cent. ? Ans. 31.25.

3. A merchant sold on commission, 300 barrels of flour at $7 a barrel; what was his commission at $2\frac{1}{2}$ per cent. ? Ans. $52.50.

4. Sold at auction 30 hogsheads of tobacco, at $105 a hogshead; what were the auctioneer's fees at $3\frac{1}{4}$ per cent. ? Ans. $$102.37\frac{1}{2}$.

5. Sold at auction a house for $6500 and the furniture for $5650; what were the auctioneer's fees at $2\frac{1}{8}$ per cent. ? Ans. $$258.18\frac{3}{4}$.

6. A commission merchant sold 12 pieces of muslin, each piece 30¼ yards, at 11 cents a yard; what was the commission at 5½ per cent.? Ans. $2.20.

7. Sold 42 tons, 18 cwt. 38 lb. of iron at 1½ cents a pound; what is the commission at 3⅛ per cent.?
Ans. $40.23+.

8. A butter dealer received 75 firkins of butter, each firkin 56 lb., to sell on commission; he sold them at 22½ cents a pound; what was his commission at 10 per cent., and what did he return to the owner?

Ans. { $94.50 commission,
$850.50 returned.

9. Sold at auction, 150 hogshead of sugar, each hogshead weighing 11 cwt. 50 lb., at $7 per hundred; what was the auctioneer's commission at 1¼ per cent., and to how much was the owner entitled?

Ans. { $150.93¾ commission,
$11924.06¼ for owner.

Art. 186. To find the commission when the commission and purchase are both to come out of the same sum,

Rule.—*Divide the given amount by 1, increased by the per cent.; the quotient will be the amount of the purchase, and the balance of the money will be the commission.*

10. A commission merchant received $10000 to be invested in cigars; what was the commission at 5 per cent., and how much was he to expend?

Ans. { $9523.81 expended,
$476.19 commission.

11. A real estate broker received $100000 to be invested in property, after deducting his commission at 7 per cent.; what was his commission, and how much did he invest in property?

Ans. { $6542.06 commission,
$93457.94 in property.

12. An agent received $3500, to buy cotton for a fac-

tory, after deducting commission at 1¾ per cent.; he bought at 8 cents a pound. How many pounds did he buy? Ans. 42997½ lb.

13. A real estate agent purchased a house and charged 2½ per cent. for services rendered; he sent in a bill of $3224.24; what did he pay for the house?
Ans. $3145.60.

14. A merchant in London sent to his agent in New York £7786. 4*s.* 10*d.* to be invested in flour, after deducting 4 per cent. commission on the sum to be expended, what was the amount of his commission?
Ans. £299. 9*s.* 5*d.*

INSURANCE.

ART. 187. What is Insurance?

Insurance is the payment of a certain sum of money in order to secure the value of property destroyed or injured by fire, water, or other accidents.

ART. 188. How is insurance calculated?

By percentage.

1. What will it cost to insure the stock of a store, valued at $13500, at 1¼ per cent.? Ans. $168.75.

2. What does it cost to insure a vessel worth $800 at 2⅛ per cent.? Ans. $17.

3. What does it cost to insure a store worth $6850, at ½ per cent., and the stock $7683.45 at ⅜ per cent.?
Ans. $63.06.

4. What does it cost to insure a vessel worth $13000, at 2⅛ per cent., and the cargo $18268.50, at 1⅞ per cent.? Ans. $618.78.

5. A piano maker has 25 pianos worth $375 each; what will it cost to obtain insurance upon them at 50 cents on a hundred dollars? Ans. $46.88.

6. What will a person have to pay to get furniture worth $3500 insured, at 35 cents on $100?
Ans. $12.25.

7. What does it cost to insure ¾ of a vessel worth $27500, at 3⅖ per cent., and ⅗ of the cargo worth $126875, at 2 per cent.? Ans. $2223.75.

8. A person bought a house, and paid the insurance at 2 per cent.; the whole of which amounted to $2040; what was the value of the house, and how much was the the insurance?

Ans. { $2000 for the house,
$40 " " insurance.

9. A cotton broker bought and insured at 3½ per cent., 50 bales of cotton; he paid for the whole $2750; what was the price per bale of the cotton, and how much the insurance?

Ans. { $53.14 per bale,
$93 for insurance.

10. A factory worth $17550, was insured at 10 per cent. for such an amount as would cover the value of the building and the insurance; what was the amount insured? Ans. $19500.

11. A merchant shipped 400 barrels of fish at $3.50 per barrel; for what amount must he insure at 5 per cent., to cover the value of the fish and insurance?
Ans. $1473.68.

12. If it costs $400 to get a vessel worth $12500 insured, what is the percentage? Ans. 3⅕ per cent.

13. I have a stock of goods worth $37560.75; I get ⅘ insured for $178.20; what is the rate per cent.?
Ans. $.593 on $100.

14. A merchant imported 365 pieces of silk, each piece 44½ yards, at $2.40 a yard; he got them insured

at 5¼ per cent. on the selling price of $3 a yard; if fire should destroy those goods, and he get the amount insured for, how much would he make?

Ans. $7065.49.

15. A merchant imported 450 pieces of silk, each piece 35¼ yd., at $1 a yard; what was the insurance at 4½ per cent.? Ans. $713.81¼.

16. Shipped from Havre to New York, $40000 worth of merchandise; it was divided into 20 equal portions, and sent in as many different vessels without insurance; if one shipment be lost, would it be more or less advantageous, than making one shipment of the whole, receiving the goods safely, and paying insurance at 6 per cent.? Ans. $400 gain.

17. A cotton broker sent 500 bales of cotton to Liverpool; each bale weighed 950 lb., and the cost was 11½ cts. a pound; the whole was insured for $2185; what was the per cent.? Ans. 4 per cent.

18. Shipped from New York to London 10000 bushels of corn, 31¼ cts. a bushel; the whole was insured for $234.37½; what was the per cent.?

Ans. 7½ per cent.

BROKERAGE AND STOCKS.

ART. 189. What is Brokerage?

Brokerage is an amount of money paid to a person called a broker, for dealing in money, stocks, &c.

ART. 190. What is stock?

Stock is the capital of an individual or company, and consists of money, goods, &c.

ART. 191. How is stock divided?

Into parts called shares, usually of $100 each.

ART. 192 When is stock said to be at par?

When a share is worth the amount for which it was first issued.

ART. 193. When is stock above par?

When it is worth more than the amount for which it was first issued.

ART. 194. When is stock below par?

When it is worth less than the amount for which it was first issued.

ART. 195. How is the amount of the rise and fall of stock estimated?

By percentage.

1. What is the value of 10 shares of Erie Railroad stock, at $85 a share? Ans. $850.

2. What is the value of 16 shares, par value $100, of Union Bank stock, at an advance of 12 per cent.? Ans. $1792.

3. What is the value of 30 shares, par value $100, of Hudson River Railroad stock at 17 per cent. below par? Ans. $2490.

4. What is the value of 25 shares of New Haven Railroad stock at 18 per cent. advance, the par value being $100 a share? Ans. $2950.

5. What is the value of 48 shares of Bank stock at 5½ per cent. advance, par value $100 a share? Ans. $5064.

6. A broker purchased 36 shares of Crystal Palace stock at $43 a share; what is his brokerage at 1¼ per cent., par value $100? Ans. $19.35.

7. What is the brokerage at 1⅜ per cent., for purchas

ing 50 shares of the New York Gas Co. stock, at 45 per cent. advance, par value $100 a share.
Ans. $99.69.

8. What will a broker charge to change $450 uncurrent into current money, at 1 per cent. discount?
Ans. $4.50.

9. What will a broker charge to change into current money $3654 of the bills of the Bank of Ohio, upon which there is a discount of 2¼ per cent.?
Ans. $82.22.

10. A person has $3000 of the Bank of Indiana, upon which there is a discount of 3½ per cent., and $2000 of the Bank of Pennsylvania, upon which there is a discount of 1¼ per cent.; how much will a broker charge to change the amount into current money? Ans. $130.

11. A person had $5500 in uncurrent money which he wanted to change into current; upon $500 of the above there was a discount of 2 per cent., on $650, 2¼ per cent., on $325, 1½ per cent., on $1000, 1¼ per cent., on $2250 ½ per cent., and on the remainder, 1 per cent.; what will he charge to discount the whole? Ans. $61.

12. What will a person receive for $250 uncurrent money upon which there is a discount of 2½ per cent.?
Ans. $243.90.

13. A person has $3200 in bills of the Bank of Maryland on which there is a discount of 3¾ per cent.; what will he receive in bankable money if the brokerage be taken out of the above amount? Ans. $3080.

14. A person has $350 upon which there is a discount of 1⅛ per cent.; $725, 2⅛ per cent. discount; $1236, 2 per cent. discount, and $300, 1 per cent. discount; what will he receive if the brokerage be taken out of the money changed? Ans. $2563.93⅝.

INTEREST.

Art. 196. What is Interest?

Interest is a rule for calculating what should be paid for the use of money.

Art. 197. What are the terms used in interest?

Principal, Interest, Amount, Rate per cent., and Time.

Art. 198. What is the principal?

The Principal is the sum of money at interest.

Art. 199. What is the interest?

Interest is the sum paid for the use of the principal.

Art. 200. What is the amount?

The amount is the sum of the principal and interest.

Note.—*Per Annum*, signifies "by the year."

Art. 201. To find the interest of any sum of money for one year,

Rule.—*Multiply the given sum by the per cent. per annum.*

1. What is the interest of $712 for one year, at 6 per cent. per annum? Ans. $42.72.

2. What is the interest of $329.50 for one year, at 7 per cent. per annum? Ans. $23.065.

3. What is the interest of $986.30 for one year, at 6½ per cent. per annum? Ans. $64.109+.

4. What is the interest of $12600 for one year at 4⅖ per cent. per annum? Ans. $554.40.

5. What is the amount of $14 for one year, at 3½ per cent. per annum? Ans. 14.49.

6. What is the amount of $4186.25 for one year, at 5½ per cent. per annum? Ans. $4416.498.

7. What is the amount of £168 for one year, at 7 per cent. per annum? Ans. £179. 15*s*. 2*d*. 1⅗ q.

8. What is the interest of £286. 12*s*. for one year, at 8½ per cent. per annum? Ans. £24. 7*s*. 2½*d*.

9. What is the amount of £3856. 18*s*. 9*d*. for one year, at 5 per cent. per annum? Ans. £4049. 15*s*. 8¼*d*.

10. What is the interest of $1745.40 for one year at 16⅔ per cent. per annum? Ans. $290.90.

11. What is the amount of $1001.75 for one year, at 6⅝ per cent. per annum? Ans. $1068.15+.

12. What is the amount of £44 3*s*. 10½*d*. for one year, at 5⅓ per cent. per annum? Ans. £46 11*s*.+

13. What is the amount of £75 13*s*. 5*d*. for one year, at 6¾ per cent. per annum? Ans. £80 15*s*. 6¾*d*.+

14. What is the amount of $800.07 for one year, at 7¾ per cent. per annum? Ans. $8[illegible]2.075.

15. What is the amount of $1601.51 for one year, at 8¼ per cent. per annum? Ans. $1733.634+.

16. What is the amount of $7266.28 for one year, at 10¼ per cent. per annum? Ans. $8011.073.

ART. 202. To find the interest for two or more years,

RULE.—*Find the interest for one year and multiply it by the number of years.*

17. What is the interest of $450 for 2 years at 6 per cent. per annum? Ans. $54.00.

18. What is the interest of $700 for 3 years, at 7½ per cent. per annum? Ans. $157.50.

19. What is the interest of $3875.20 for 5 years, at 4¾ per cent. per annum? Ans. $920.36.

20. What is the interest of £2000 for 7 years, at 8⅓ per cent. per annum? Ans. £1166 13*s.* 4*d.*

21. What is the interest of £1655 13*s.* 8*d.* for 6 years, at 4⅞ per cent. per annum? Ans. £484 5*s.* 8¾*d.*+

22. What is the amount of $7500 for 5 years, at 3¼ per cent. per annum? Ans. $8718.75.

23. What is the amount of $11459.62½ for 3 years, at 10½ per cent. per annum? Ans. $15069.406+.

24. What is the amount of £1215 5*s.* 2*d.* for 2 years, at 5½ per cent. per annum?
Ans. £1348 18*s.* 8¾*d.*

25. What is the amount of £1 for 11 years, at 4⅝ per cent. per annum? Ans. £1 10*s.* 2*d.*

26. What is the amout of $1 for 5 years 3¾ per cent. per annum? Ans. $1.18¾.

27. What is the interest of £144 2*s.* 8¼*d.* for 8 years, at 6¼ per cent. per annum? Ans. £72 1*s.* 4⅛*d.*

28. What is the interest of $500 from June 1st, 1837, to June 1st, 1840, at 6½ per cent. per annum?
Ans. $97.50.

29. What is the interest of $1694.20 from Jan. 4th, 1845, to Jan. 4th, 1849, at 5¼ per cent. per annum?
Ans. $355.782.

30. What is the amount of $2175.68, from July 15th, 1841, to July 15th, 1846, at 7½ per cent. per annum?
Ans. $2991.56.

ART. 203. To find the interest for years and months,

RULE.—*Find the interest for one year and divide it by 12 to obtain the interest for one month; then multiply the interest for one year by the number of years, for one month by the number of months, and add the two products. Or,*

Multiply the given sum by the product of the percentage and time, expressed in years or fraction of a year.

31. What is the amount of $1 for 2 yr. 6 mo. at 8 per cent. per annum? Ans. $1.20.

32. What is the amount of £1 for 3 yrs. 4 mo. at 5½ per cent. per annum? Ans. £1 3*s*. 8*d*.

33. What is the interest of $68.75 for 2 yr. 2 mo. at 4½ per cent. per annum? Ans. $6.703.

34. What is the interest of $400.60 for 3 yr. 9 mo., at 5½ per cent. per annum? Ans. $82.623.

35. What is the interest of £284 10*s*. 6*d*. for 3 yr. 5 mo. at 7 per cent. per annum? Ans. £68 0*s*. 11¾*d*.

36. What is the amount of $911.12½ for 2 yr. 8 mo., at 3⅜ per cent. per annum? Ans. $993.126+.

37. What is the interest of $1980.44 for 8 mo., at 4¾ per cent. per annum? Ans. $62.713+.

38. What is the amount of $1000 for 9 mo., at 5¼ per cent. per annum? Ans. $1039.375.

39. What is the amount of $100 for 10 mo., at 7½ per cent. per annum? Ans. $106.25.

40. What is the interest of $10 for 19 mo., at 7 per cent. per annum? Ans. $1.108.

41. What is the interest of $1250.53 for 2 yr. 11 mo., at 3⅛ per cent. per annum? Ans. $113.98+.

42. What is the interest of £88 10*s*. for 6 mo., at 6 per cent. per annum? Ans. £2 13*s*. 1*d*.+

43. What is the amount of £145 12*s*. 6*d*. for one yr. 10 mo., at 8½ per cent. per annum? Ans. £168 6*s*. 4⅜*d*.

44. What is the amount of £2500 for 3 yr. 11 mo., at 4¼ per cent. per annum? Ans. £2916 2*s*. 11*d*.

45. What is the interest of £10000 for 3 yr. 7 mo., at 4⅜ per cent. per annum? Ans. £1567 14*s*. 2*d*.

46. What is the interest of £1000 for 23 mo., at 6 per cent. per annum? Ans. £115.

47. What is the interest of 5000 francs for 13 mo., at $4\frac{1}{4}$ per cent. per annum? Ans. 230.20+ francs.

48. What is the amount of $6841.45 for 2 yr. 4 mo., at 5 per cent. per annum? Ans. $7639.619+.

49. What is the amount of $5010 for 14 mo., at $3\frac{5}{8}$ per cent. per annum? Ans. $5221.881+.

50. What is the interest of $722.11 for 13 yr. 4 mo., at $7\frac{1}{2}$ per cent. per annum? Ans. $722.11.

51. What is the amount of $2000, from June 1st, 1827, to Oct. 1st, 1832, at 7 per cent. per annum? Ans. $$2746.66\frac{2}{3}$.

52. What is the amount of $1850, from July 1st, 1850, to Jan. 1st, 1853, at 7 per cent. per annum? Ans. $2173.75.

53. What is the amount of $3125.75, from Oct. 1st, 1837, to Sept. 1st, 1840, at 5 per cent. per annum? Ans. $3581.58.

54. What is the interest of $13491.50, from March 1st, 1848, to August 1st, 1852, at 8 per cent. per annum? Ans. $4766.996+.

55. What is the interest of $1786.90, from June 20th, 1845, to July 20th, 1850, at 6 per cent. per annum. Ans. $545.004+.

56. What is the interest of £520 13*s.* 6*d.*, from Dec. 24th, 1849, to Nov. 24th, 1850, at 4 per cent. per annum? Ans. £19 1*s.* $9\frac{3}{4}$*d.*

57. What is the amount of £3106 15*s.* 8*d.*, from April 15th, 1851, to Dec. 15th, 1853, at 7 per cent. per annum? Ans. £3686 14*s.* $3\frac{3}{4}$*d.*+

ART. **204.** To find the interest for years, months, and days,

Find the interest for one year, one month, and one day; multiply the interest for one year by the number of years, for one month by the number of months, and for one day *by the number of days; the sum of the three products will be the interest.* Or,

Multiply the given principal by the product of the per cent. and time, expressed in years or the fraction of a year.

NOTE.—Count 30 days to a month, which gives 360 days to a year; 360 days has been considered as a commercial year on account of the number being divisible by so many other numbers, a property which facilitates the finding of interest by means of aliquot parts; and this method of calculating interest should be frequently employed by the pupil.

Since tables of interest, for any number of days, are now extensively used, based upon 365 days to to the year, it is probable, at least so far as interest for days is concerned, that the last number will be the most employed in interest.

58. What is the interest of $100 for 1 yr. 3 mo. 10 days, at 6 per cent. per annum? Ans. 7.66\frac{2}{3}$.

59. What is the interest of $1000 for 9 mo. 15 days, at 7 per cent. per annum? Ans. 55.416\frac{2}{3}$.

60. What is the interest of $1700 for 2 yr. 3 mo. 10 days, at 5 per cent. per annum? Ans. $193.611.

61. What is the interest of $3000 for 25 days, at 7 per cent. per annum? Ans. $14.583.

62. What is the interest of £2500 for 5 mo. 18 days, at 4$\frac{1}{2}$ per cent. per annum? Ans. £52 10*s.*

63. What is the interest of £1 for 2 yr. 11 mo. 19 days, at 3 per cent. per annum? Ans. 1*s.* 9.38*d.*

64. What is the amount of $1 for 2 yr. 6 mo. 12 days, at 7 per cent. per annum? Ans. 1.177\frac{1}{3}$.

65. What is the amount of $1 for 9 mo. 22 days, at 6$\frac{3}{4}$ per cent. per annum? Ans. $1.054.

66. What is the interest of $450.50 for 3 yr. 5 mo 20 days, at 5 per cent. per annum? Ans. $78.211+.

67. What is the amount of £145 12*s.* 6*d.*, for 1 yr 10 mo. 16 days, at 8$\frac{1}{2}$ per cent. per annum?
Ans. £168 17*s.* 4$\frac{1}{2}$*d.*

68. What is the interest of $710.01 for 3 yr. 11 mo 8 days, at 7 per cent. per annum? Ans. $195.765.

69. What is the interest of $4470.80 for 4 yr. 5 mo. 10 days, at 7½ per cent. per annum? Ans. $1490.266.

70. What is the interest of $2000 for 75 days, at 4¼ per cent. per annum? Ans. $17.71.

71. What is the amount of $3600 for 53 days, at 5½ per cent. per annum? Ans. $3629.15.

72. What is the amount of $25000 for 13 days, at 8 per cent. per annum? Ans. $25072.222.

73. What is the interest of $14.50 for 19 days, at 6 per cent. per annum? Ans. $ .0459⅙.

74. What is the amount of $112.75 for 100 days, at 8⅓ per cent. per annum? Ans. $115.359+.

75. What is the interest of $6000 for 11 yr. 1 mo. 10 days, at 9 per cent. per annum? Ans. $6000.

76. What is the amount of £10000 for 3 yr. 7 mo. 12 days, at 6 per cent. per annum? Ans. £12170.

77. What is the interest of $7000 for 6 yr. 5 mo. 11 days, at 7 per cent. per annum? Ans. $3159.138.

78. What is the interest of $400, from March 1st, 1847, to July 16th, 1849, at 7 per cent. per annum? Ans. $66.50.

79. What is the interest of $2311.50, from May 3d, 1850, to January 16th, 1853, at 6 per cent. per annum? Ans. $374.848+.

80. What is the amount of £980, from October 13th, 1836, to June 1st, 1840, at 5 per cent. per annum? Ans. £1158 0*s.* 8*d.*

81. What is the amount of £257 13*s.* 6*d.*, from July 1st, 1844, to July 17th, 1844, at 6½ per cent. per annum? Ans. £258 8*s.* 4½*d.*+

82. What is the amount of $3155.49, from August 15th, 1841, to May 1st, 1849, at 6 per cent. per annum? Ans. $4615.43.

83. What is the amount of $10, from November 19th,

1836, to December 1st, 1849, at 5½ per cent. per annum? Ans. $17.169.

ART. **205.** To find the interest of any sum at 6 per cent per annum,

RULE.—*Consider that* 6 *per cent. per annum gives* ½ *per cent. a month, and* $\frac{1}{60}$ *per cent. a day; multiply the* 6 *per cent. by the number of years, the* ½ *per cent. by the number of months, and* $\frac{1}{60}$ *per cent. by the number of days; add these three products together and their sum will be the percentage for the whole time; multiply the given sum by this percentage, and the product will be the interest for the given time.*

ART. **206.** To change the interest at a known rate per cent. per annum, into the interest at another rate, per cent. per annum,

RULE.—*Add to, or take from the interest at a known rate per cent. per annum such a part of itself as the excess or deficiency of the required rate per cent. per annum is of the known rate.*

84. Find the interest of $600 for 2 yr. 8 mo., at 6 per cent. per annum, and change it to 5 and 7 per cent. per annum.

Ans. { at 6 per cent. $96.
at 5 per cent. $80.
at 7 per cent. $112.

85. Find the interest of $450 for 3 yr 7 mo., at 6 per cent. per annum, and change it to 4 and 8 per cent. per annum?

Ans. { at 6 per cent. $96.75.
at 4 per cent. $64.50.
at 8 per cent. $129.00.

86. Find the interest of $2964.12 for 11 mo., at 6 per cent. per annum, and change it to 7 and 8 per cent. per annum.

Ans. { at 6 per cent. $163.026.
at 7 per cent. $190.197.
at 8 per cent. $217.368.

87. Find the interest of $785.10 for 1 yr. 6 mo. 18 days, at 6 per cent. per annum, and change it to 5 and 9 per cent. per annum.

Ans. at 6 per cent. $73.014.
at 5 per cent. $60.845.
at 9 per cent. $109.521.

88. Find the interest of $1420.50 for 2 yr. 3 mo. 25 days, at 6 per cent. per annum, and change it to 3, 4, and 7½ per cent. per annum.

Ans. at 6 per cent. $197.686.
at 3 per cent. $98.843.
at 4 per cent. $131.79.
at 7½ per cent. $247.107.

89. Find the interest of $12850, for 90 days, at 6 per cent. per annum, and change it to 4½, 5, and 7 per cent. per annum.

Ans. at 6 per cent. $192.75.
at 4½ per cent. $144.562.
at 5 per cent. $160.625.
at 7 per cent. $224.875.

90. Find the interest of $750 for 9 mo. 17 days, at 6 per cent. per annum, and change it to 5 and 7 per cent. per annum.

Ans. at 6 per cent. $35.875.
at 5 per cent. $29.895.
at 7 per cent. $41.854.

91. Find the interest of $3654.25 for 33 days, at 6 per cent. per annum, and change it to 10 and 11 per cent. per annum.

Ans. at 6 per cent. $20.098.
at 10 per cent. $33.497.
at 11 per cent. $36.846.

92. Find the interest of $1411.26, for 123 days, at 6 per cent. per annum, and change it to 12 and 13 per cent per annum.

Ans. at 6 per cent. $28.93.
at 12 per cent. $57.861.
at 13 per cent. $62.683.

93. Find the interest of $14544.20 for 183 days, at 6

per cent. per annum, and change it to 14 and 15 per cent. per annum.

Ans. at 6 per cent. $443.598
at 14 per cent. $1035.062
at 15 per cent. $1108.995

94. Find the interest of £400 for 7 mo. 11 days, at 6 per cent. per annum, and change it to 5 and 7 per cent. per annum.

Ans. at 6 per cent. £14 14*s.* 8*d.*
at 5 per cent. £12 5*s.* 6⅔.
at 7 per cent. £17 3*s.* 9⅓.

95. Find the interest of £300 for 2 yr. 7 mo., at 6 per cent. per annum, and change it to 4 and 5 per cent. per annum.

Ans. at 6 per cent. £46 10*s.*
at 4 per cent. £31.
at 5 per cent. £38 15*s.*

96. Find the interest of £601 12*s.* for 78 days, at 6 per cent. per annum, and change it to 9 and 10 per cent. per annum.

Ans. at 6 per cent. £7 16*s.* 3½*d.*
at 9 per cent. £11 14*s.* 5¼*d.*
at 10 per cent. £13 0*s.* 6⅚*d.*

97. Find the interest of £71 9*s.* 10½*d.* for 23 days, at 6 per cent. per annum, and change it to 12 and 15 per cent. per annum.

Ans. at 6 per cent. 5*s.* 5¾*d.*
at 12 per cent. 10*s.* 11½*d.*
at 15 per cent. 13*s.* 8⅜*d.*

98. Find the amount of $1700 for 100 days, at 6 per cent. per annum, and change it to the amount at 5 and 7 per cent. per annum.

Ans. at 6 per cent. $1728.333.
at 5 per cent. $1723.61.
at 7 per cent. $1733.06.

99. Find the amount of $929.90 for 2 yr. 1 mo., at 6 per cent. per annum, and change it to the amount at 5½ and 6½ per cent. per annum.

Ans. at 6 per cent. $1046.137.
at 5½ per cent. $1036.451.
at 6½ per cent. $1055.823.

100. Find the amount of $16941.20 for 1 yr. 7 mo.

28 days, at 6 per cent. per annum, and change it to the amount at 4¾ and 8⅓ per cent. per annum.

Ans. { at 6 per cent. $18629.672.
at 4¾ per cent. $18277.907.
at 8⅓ per cent. $19286.29.

101. Find the amount of £3000 for 6 mo. 17 days, at 6 per cent. per annum, and change it to 12½ and 15 per cent. per annum.

Ans. { at 6 per cent. £3098. 10*s.*
at 12½ per cent. £3205. 4*s.* 2*d.*
at 15 per cent. £3246. 5*s.*

102. Find the interest of $2500 for 7 mo. 20 days, at 5 per cent. per annum, and change it to 4 and 6 per cent. per annum.

Ans. { at 5 per cent. $79.861.
at 4 per cent. $63.891.
at 6 per cent. $95.831.

103. Find the interest of $725.50 for 150 days, at 7 per cent. per annum, and change it to 6 and 8 per cent. per annum.

Ans. { at 7 per cent. $21.16.
at 6 per cent. $18.14.
at 8 per cent. $24.18.

Art. 207. To find the interest when 365 days is considered as a year,

Rule.—*Find the interest for one year and multiply it by the number of years and fractional parts of a year.*

104. What is the interest of $250 for 60 days, at 7 per cent. per annum? Ans. $2.88.

105. What is the interest of $600 for 90 days, at 6 per cent. per annum? Ans. $8.88.

106. What is the amount of $350 for 75 days, at 8 per cent. per annum? Ans. 355.75.

107. What is the amount of $1000 for 100 days, at 6½ per cent. per annum? Ans. $1017.81.

108. What is the amount of £100 for 60 days, at 5½ per cent. per annum? Ans. £109. 0*s.* 9¾*d.*

109. What is the amount of $269.50 for 120 days, at 7 per cent. per annum? Ans. $275.70.

110. What is the amount of $3175.25 for 180 days, at 6 per cent. per annum? Ans. $3269.21.

111. What is the interest of $10000 for 40 days, at 5 per cent. per annum? Ans. $54.79.

112. What is the interest of £1225. 10*s.* for 30 days, at 10 per cent. per annum? Ans. £10. 1*s.* 2¾*d.*

113. What is the interest of £2016. 18*s.* 9*d.* for 45 days, at 8 per cent. per annum?
Ans. £19. 17*s.* 10¼*d*+.

114. What is the amount of $3110.45 for 90 days, at 5½ per cent. per annum? Ans. $3152.77.

115. What is the amount of $1 for 75 days, at 6 per cent. per annum? Ans. $1.01.

116. What is the amount of £1 for 150 days, at 8½ per cent. per annum? Ans. £1. 0*s.* 8½*d.*

PROBLEMS.

ART. 208. To find the rate per cent., when the principal, interest, and time are given,

RULE.—*Find the interest of the principal at one per cent. per annum, for the given time, and divide it into the given interest; the quotient will be the rate per cent.*

117. The interest of $250 dollars for 2 years was $30; what was the rate per cent. per annum?
Ans. 6 pr. ct.

118. The interest of $1750 for 30 days was $13.12½ what was the rate per cent. per annum?
Ans. 9 pr. ct.

119. The interest of $78.75 for 1 yr. 9 mo. was $5.5125; what was the rate per cent. per annum?
Ans. 4 pr. ct.

120. $1000 was put out at interest for 2 yr. 8mo.; the interest during that time was $200; what was the rate per cent. per annum? Ans. 7½ pr. ct.

121. The interest of $2100 for 3 yr. 1 mo. 20 days was $296.625; what was the rate per cent. per annum?
Ans. 4½ pr. ct.

122. In 9 months the interest on £1829. 10*s.* was £68. 12*s.* 1½*d.*; what was the rate per cent. per annum?
Ans. 5 pr. ct.

123. In 1 yr. 4 mo., $7500 amounted to $7850; what was the rate per cent. per annum? Ans. 3½ pr. ct.

124. If £688. 2*s.* 6*d.* yield £82. 11*s.* 6*d.* interest in 1 yr. 6 mo., what is the rate per cent. per annum?
Ans. 8 pr. ct.

Art. 209. To find the time, when the principal, interest, and rate per cent. per annum are given,

Rule.—*Find the interest of the given principal for one year at the given rate per cent. per annum, and divide it into the given interest; the quotient will be the time in years.*

125. The interest of $200 for a certain period of time, at 6 per cent. per annum, was $30; what was the time?
Ans. 2 yr. 6 mos.

126. At the rate of 7 per cent. per annum, the interest of $3060 was $642.60; what was the time?
Ans. 3 yrs.

127. The interest of £432. 15*s.* for a certain time, at 6 per cent. per annum, was £129. 16*s.* 6*d.*; what was the time? Ans. 5 years.

128. At the rate of 4½ per cent. per annum the interest of $600 was $2.25; what was the time?
Ans. 30 days.

129. The amount of $765.60, at 7 per cent. per annum, was $772.299, what was the time?
Ans. 45 days.

130. The amount of £1021 17*s.* 6*d.* for a certain time at 5 per cent. per annum, was £1098 10*s.* 3¾*d.*; what was the time? Ans. 1 yr. 6 mo.

Art. 210. To find the principal, when the interest, rate per cent. and time are given,

Rule.—*Find the interest of* $1, *for the given time and rate per cent. and divide it into the given interest.*

131. The interest of a certain sum of money for 2 years, at 6 per cent. per annum, was $60; what was the principal? Ans. $500.

132. The interest of a sum of money for 9 months, at 7 per cent. per annum, was $126; what was the principal? Ans. $2400.

133. The interest of a sum of money for 1 yr. 6 mo., at 8 per cent. per annum, was $195; what was the principal? Ans. $1625.

134. If the interest of a sum of money for 3 yr. 4 mo., at 6 per cent. per annum is $142.73, what is the principal? Ans. $713.65.

135. The interest of a sum of money was £370 10*s.*, the time 2 yr. 4 mo. 15 days, and the rate, 4 per cent. per annum; what was the principal? Ans. £3900.

Note.—There is one more problem, viz.: when the amount, time and rate per cent. are given, to find the principal; this is the rule of discount, and will be treated of under that name.

PARTIAL PAYMENTS.

Art. 211. What is the United States' rule for casting interest, when partial payments are made?

Rule.—*Apply the payment in the first place to the interest then due.*

If the payment exceeds the interest, the surplus goes towards discharging the principal, and the subsequent interest is to be computed on the balance of principal remaining due.

If the payment be less than the interest, the surplus must not be taken to augment the principal; but interest continues on the former principal until the period when the payments, taken together, exceed the interest due, and then the surplus is to be applied towards discharging the principal, and the interest is to be computed on the balance, as aforesaid.

(136.)

$700. NEW YORK, *July* 1*st*, 1849.

For value received, I promise to pay to James Brown, or order, seven hundred dollars, on demand, with interest, at 7 per cent. per annum.

On this note were the following endorsements.

July 1st, 1850, $200.
July 1st, 1851, $400.

How much was due July 1st, 1852?

Ans. $200.55+.

(137.)

$500. NEW YORK, *Jan.* 1*st*, 1850.

On demand, I promise to pay to C. G. Murch, five hundred dollars, with interest, at 6 per cent., value received. JAS. THOMPSON.

On this note were the following endorsements.

Jan. 1st, 1851, $300.
Jan. 1st, 1852, $200.

How much is due Jan. 1st, 1853?

Ans. $46.428.

(138.)

$2000. NEW YORK, May 1st, 1850

On demand, I promise to pay to Edward Brown, two thousand dollars, with interest at 7 per cent., value received. JOHN PETERSON.

On this note were the following endorsements:

May 1st, 1851, $500.
May 1st, 1852, $450.
May 1st, 1853, $750.
May 1st, 1854, $400.

What will be due May 1st, 1855? Ans. $311.761.

(139.)

$1000. NEW YORK, Aug. 1, 1850.

On demand, I promise to pay Seneca Solomon, one thousand dollars, with interest at 5 per cent., value received. JUNIUS DUSENBURY.

On this note were the following endorsements:

Dec. 1st, 1850, $310.25.
April 1st, 1851, $225.50.
Aug. 1st, 1852, $400.00.

What was due January 1st, 1853? Ans. $128.151.

(140.)

$500. NEW YORK, Jan. 1st, 1853.

On demand, I promise to pay James Sweet, five hundred dollars, with interest at 6 per cent., value received.
STEPHEN JONES.

On this note were the following endorsements:

March 1st, $50.
March 15th, $150.
June 15th, $200.
Oct. 1st, $50.

What was the balance? Ans. $62.607+.

(141.)

$495.50. NEW YORK, Sept. 3d, 1852.

On demand, I promise to pay to James Anderson, four hundred and ninety-five $\frac{50}{100}$, with interest at 8 per cent., value received. PETER SMART.

On this note were the following endorsements:

Jan. 1st, 1853, $200.
May 13th, " $200.

What was the balance January 1st, 1854? Ans.

(142.)

$3000. NEW YORK, Sept. 23, 1829.

On demand, I promise to pay to Jones, Osborn & Co., three thousand dollars, with interest at 6 per cent., value received. THOMPSON WHITE.

On this bill were the following endorsements:

Sept. 23d, 1831, $1000.
Jan'y 23d, 1832, $705.50.
Aug. 10th, 1832, $750.
July 19th, 1833, the balance was paid.

What was it? Ans.

COMPOUND INTEREST.

ART. 212. What is Compound Interest?

Compound interest is when the amount at the end of each year becomes the principal for the succeeding year.

ART. 213. To find the compound interest of any sum of money,

RULE.—*Find the amount of the given sum for one year; call this amount a new principal for the second year and* *find its amount for one year; the result will be the compound amount of the given principal for two years; call this second amount a principal for the third year, and so proceed as many times as there are years; the last amount will be the compound amount, and from it subtract the given principal; the remainder will be the compound interest.*

1. What is the compound interest of $300 for 3 years, at 6 per cent. per annum? Ans. $57.3048.

2. What is the compound interest of $10000, for 3 years, at 7 per cent. per annum? Ans. $2250.43.

3. What is the compound interest of £320, for 5 years, at 5 per cent. per annum? Ans. £88 8*s.* 2¼*d.*+

4. What is the compound amount of £450, for 3 years, at 10 per cent. per annum? Ans. £598 19*s.*

5. What is the compound amount of $200, for 2 years, at 7½ per cent. per annum? Ans. $231.12½.

6. What is the compound amount of £250, for 4 years, at 8 per cent. per annum? Ans. £340 2*s.* 5¼*d.*+

ART. 214. To find the compound interest, when there are years and parts of a year,

RULE.—*Find the amount as many times as there are whole years; then find the amount of this amount for the partial year.*

7. What is the compound interest of $500 for 2½ years, at 5 per cent. per annum? Ans. $65.03⅛.

8. What is the compound interest of $400 for 2 yrs 9 mos., at 6 per cent. per annum? Ans. $69.67.

9. What is the compound amount of $250 for 3 yr. 2 mo. 20 da., at 8 per cent. per annum? Ans. $320.526.

10. Find the compound amount of £300 for 2 yr. 7 mo. 15 da., at 5 per cent. per annum.

Ans. £341 1*s.* 8¼*d.*

11. What is the compound interest of £224 17*s.* 6*d.* for 3 yr. 6 mo., at 7 per cent. per annum?

Ans. £60 4*s.* 11½*d.*

DISCOUNT.

ART. 215. What is Discount?

Discount is an allowance made for the payment of money before it is due.

ART. 216. How many kinds of discount are there?

Two: Bank and True Discount.

ART. 217. To find the bank discount on any sum of money,

RULE.—*Find the interest of the given sum for* 3 *days more than the given time, at the given rate per cent. per annum; the result will be the bank discount.*

NOTE.—The three days are called days of grace. It is customary for banks and merchants to allow notes to run 3 days longer than the specified time, and they always charge interest for those days. The discount or present worth $1 or £1 is carried out very particularly, because it is often used as a unit of comparison, especially when a divisor.

ART. 218. What is meant by the term present worth?

It is that which remains after the discount is subtracted from the given sum.

ART. 219. What is the result sometimes called?

It is called the cash value.

1. What is the bank discount on a note for $1, for 60 days, at 6 per cent per annum? Ans. $.0105.

2. What is the bank discount on a note for $1, for 30 days, at 7½ per cent. per annum? Ans. $.006⅞.

3. What is the bank discount on a note for $1, for 45 days, at 7½ per cent. per annum? Ans. $.01.

4. What is the bank discount on a note for £1, for 90 days, at 8 per cent per annum?

Ans. £.02$\frac{1}{15}$ or, 4*d*. 3.8 far.

5. What is the bank discount on a note for $100, for 4 mo., at 6 per cent per annum? Ans. $2.05.

6. What is the bank discount on a note for £100, payable in 6 mo., at 10 per cent. per annum?

Ans. £5 1*s*. 8*d*.

7. What is the bank discount on a note for £200 payable in 5 mo., at 9 per cent. per annum?

Ans. £7 13*s*.

8. What is the bank discount and present worth of a note for $300, payable in 9 mo., at 5½ per cent. per annum?

Ans. { $12.512 discount.
$287.487 present worth.

9. What is the bank discount and present worth of a note for $500, payable in 8½ mo., at 6½ per cent. per annum?

Ans. { $23.29 discount.
$476.71 present worth.

10. What is the bank discount and present worth of a £1000 note, payable in 75 days, at 8½ per cent. per annum?

Ans. { £18 8*s*. 3*d*.+ discount.
£981 11*s*. 8*d*.+ present worth.

11. What is the present worth of a $10 000 note, payable in 2 mo., at 7½ per cent. per annum?

Ans. $9868.75.

12. What is the present worth and bank discount of a note for $250, payable in 1 mo., at 5 per cent. per annum?

Ans. { $248.854 present worth.
$1.145 discount.

13. What is the bank discount of a note for £350, payable in 50 days, at 10 per cent. per annum?

Ans. £5, 3*s*. 0⅔*d*. discount.

14. What is the present worth and discount of a note for £450 in 1 year, at 5½ per cent. per annum?

Ans. { £425 0*s.* 10½*d.* present worth.
£24 19*s.* 1½*d.* discount.

15. What is the bank discount and present worth of a note for $750.50, payable in 3 mo., at 6 per cent. per annum?

Ans. { $11.632 discount.
$738.867 present worth.

16. What is the bank discount and present worth of a note for $3150.25, payable in 60 days, at 6¾ per cent. per annum?

Ans. { $37.212 discount.
$3113.038 present worth.

17. What is the present worth of a note for £80 12*s.*, payable in 30 days, at 9 per cent. per annum?

Ans. { £0 13*s.* 3½*d.*+ discount.
£79 18*s.* 8¼*d.*+ present worth.

18. What is the bank discount and cash value of a note for $1728, payable in 20 days, at 5½ per cent. per annum?

Ans. { $6.072 bank discount.
$1721.928 cash value.

19. Find the bank discount and cash value of a note for £112 10*s.*, payable in 30 days, at 9½ per cent. per annum?

Ans. { £0 19*s.* 7¼*d.* bank discount.
£111 10*s.* 4¾*d.* cash value.

20. How much cash is equivalent to a note for $725.80, due in six months, at 5½ per cent. per annum?

Ans. $705.508.

21. How much cash is equivalent to a note for $1255.38, payable in 4 mo., at 7 per cent. per annum?

Ans. $1225.355.

22. What is the present value of a note for £680 12*s.* 6*d.*, payable 10 mo. hence, at 8 per cent. per annum?

Ans. £634 15*s.* 11*d.*+

23. On the 1st of January, 1853, a note for $1000 was given, to be paid on the 1st of May ensuing; what was its cash value, at 7 per cent. Ans. $976.083.

24. A note of $2310 was to be paid on the 1st of October, 1852; what was its value on the 1st of June, 1852, at 6 per cent. per annum? Ans. $2262.64.

25. A note for $500, due 13th of August, 1853, was paid on the first day of July, 1853; how much was thrown off the face of the note for payment before due, reckoning interest at 7 per cent. per annum?

Ans. 4.47\frac{2}{9}$.

26. A note for £351. 11*s.* was taken up 2 mo. 20 days before due; what was paid, and what thrown off the face of the note, interest at 5 per cent. per annum?

Ans. { £347. 9*s.* 11$\frac{3}{4}$*d.* cash value,
£4. 1*s.* 0$\frac{1}{4}$*d.* discount.

27. A flour merchant bought 75 barrels of flour at $4.50 per barrel, on a credit of 3 mo., 6 per cent. per annum. Instead of waiting 3 mo., he paid the bill in cash; how much was thrown off, and how much paid?

Ans. { $332.27 cash,
$5.23 discount.

28. A merchant bought for cash, 300 barrels of pork, at $10.50 per barrel; he sold them the same day at $12 per barrel, on a note for 3 mo., at 7 per cent. per annum; what was the cash value of the sale, and how much did he make?

Ans. { $3534.90 cash value,
$384.90 gain.

29. A speculator bought 100 bales of cotton, each bale 596 lb., at 8 cents per lb., on a note for 8 mo., 7$\frac{1}{2}$ per cent. per annum; he immediately sold the entire lot for $5000 cash, and paid his note; how much did he gain?

Ans. $473.38.

30. A butter dealer bought for cash, 78 firkins of butter, 56 lb. each, at 25 cents a pound. He sold them the same day at 25$\frac{1}{2}$ cents per lb., on a note for 4 mo., at 8 per cent. per annum; did he gain or lose by the operation, and how much? Ans. $8.60 lost.

31. I bought 2000 tons of coal at $3.50 per ton,

on my note for 6 months, and sold them for the same price, on a note for 3 mo.; what was my cash gain, at 7½ per cent. per annum? Ans. $131.25.

32. A man bought a house valued at $5000, on the following terms: $2500 in cash, $1250 in 3 months, and the balance in 6 months, interest being 5 per cent. per annum; what was the cash value of the house?

Ans. $4952.08.

33. A person owed $1400, payable in 7 mo., at 4½ per cent. per annum; he paid it in 4 mo. after date. How much was taken off the face of the note for payment before due? Ans. $15.75.

34. What is the worth of the following notes at 7 per cent. per annum?

(34.)

$100. Sixty days after date, I promise to pay to the order of Solomon Levi, one hundred dollars, value received. Isaac Seaman.

Ans. $98.77.

(35.)

$296.50. Six months after date, I promise to pay to the order of C. C. Churchill, two hundred and ninety-six$\frac{50}{100}$ dollars, value received.

Abraham Van Horn.

Ans. $285.95.

(36.)

$3152.67. Three months after date, I promise to pay to the order of Job Hicks, three thousand one hundred and fifty-two$\frac{67}{100}$ dollars, value received.

Jeremiah Hobson.

Ans. $3095.66.

Art. 220. What is the true present worth of any sum of money?

It is a sum which, if put at interest, will amount to the given sum at the given rate per cent. and time.

Art. 221. To find the true present worth,

Rule.—*Divide the given sum by the amount of* $1 *or,* £1, *at the given rate per cent. and for the time; the quotient will be the true present worth.*

Art. 222. What is the true discount?

It is the difference between the true present worth and the given sum.

37. What is the true present worth of $104, payable in 8 mo., at 6 per cent. per annum? Ans. $100.

38. What is the true present worth and discount of $315, payable in 10 mo., at 6 per cent. per annum?

Ans. { $300 present worth.
$15 discount.

39. What is the true present worth and discount of £621, payable in 6 mo., at 7 per cent. per annum?

Ans. { £600 present worth.
£21 discount.

40. What is the true discount of $526.25, payable in 9 mo., at 7 per cent. per annum? Ans. $26.25.

41. What is the true present worth of $4363.20, payable in 3 mo., at 4 per cent. per annum?

Ans. $4320.

42. What is the present worth of $1318.80, payable in 7 mo., at 8 per cent. per annum? Ans. $1260.

43. What is the present worth and discount of £3172, payable in 3 mo., at $6\frac{2}{3}$ per cent. per annum?

Ans. { £3120 present worth.
£52 discount.

44. What is the present worth of $5160, payable in 4 mo., 24 days, at 8 per cent. per annum? Ans. $5000.

45. What is the discount of $721, payable in 7 mo. 6 days, at 5 per cent. per annum? Ans. $21.

46. What is the present worth and discount of $225.96, payable in 8 mo., at 7½ per cent. per annum?

Ans. $\left\{\begin{array}{l}\$215.20 \text{ present worth.}\\ \$10.76 \text{ discount.}\end{array}\right.$

47. What is the cash value of $4987.50, payable in 7 mo. 15 days, at 6¼ per cent. per annum?

Ans. $4800.

48. What is the cash value of $4000, payable in 1 yr. 7 mo., at 4 per. cent. per annum?

Ans. $3761.757.

49. What is the cash value of £2400, payable in 3 yr. 6 mo., at 8 per cent. per annum? Ans. £1875.

50. What is the cash value and discount of £300, payable in 1 yr. 5 mo., at 6 per cent. per annum?

Ans. $\left\{\begin{array}{l}\pounds 276\ 9s.\ 11\tfrac{1}{4}d.+ \text{ present worth.}\\ \pounds 23\ 10s.\ 0\tfrac{1}{2}d.+ \text{ discount.}\end{array}\right.$

51. What sum of money will amount to $5000 in 2 yr. 7 mo. 12 days, at 12 per cent. per annum?

Ans. $3805.17

52. What is the present worth and discount on $1500, payable in 1 yr. 2 mo. 20 days, at 7 per cent. per annum?

Ans. $\left\{\begin{array}{l}\$1381.78 \text{ present worth.}\\ \$118.22 \text{ discount.}\end{array}\right.$

53. What sum of money will in 2 yr. 1 mo., at 6 per cent. per annum, amount to $2261.25? Ans. 2010.

54. What sum of money will amount to £120 13*s.* 4*d.* in 10 mo., at 8 per cent. per annum?

Ans. £113 2*s.* 6*d.*

55. What sum will amount to $1375.20 in 4 mo. 18 days, at 6¼ per cent. per annum? Ans. $1343.023.

56. What sum of money will, in 60 days, amount to $14229.60, at 5 per cent. per annum?

Ans. $14112.

57. What sum of money will amount to £500 in 2 yr. 11 mo. at 7½ per cent. per annum? Ans. £410 5*s.* 1½*d.*

58. What is the present worth of $3000, one half payable in 6 mos. and the other half payable in 9 mos., at 5 per cent. per annum? Ans. $2909.197.

59. What is the present worth of $4000, one quarter payable in 1 yr. and the remainder in 1 yr. 6 mo., at 6 per cent. per annum? Ans. $2695.68.

60. What is the present worth of £7500, £4000 payable in 7 mo., at 7½ per cent. per annum, and the remainder payable in 10 mo., at 4½ per cent. per annum? Ans. £7205 16*s.* 7*d.*+

61. The sum of $10 000 is to be paid by four equal instalments; the first in 3 mo., the second in 6 mo., the third in 9 mo., and the fourth, in 1 year; what is the present worth of the $10000, at 6 per cent. per annum? Ans. $9641.073+.

62. When money is 2 per cent. a month, what sum is equivalent to $1350, payable in 15 days? Ans. $1336.63.

63. What money is worth $1600, payable in 5 mo., at 1½ per cent. a month? Ans. $1488.37.

64. A person made an investment of money, on which he lost 10 per cent. He received $4500 of his money back; how much did he invest? Ans. $5000.

65. On the 16th of August, 1829, I promise to pay $1050.69; what sum will be equivalent to the above sum, on July 1st, 1826, at 6 per cent. per annum? Ans. $884.79.

66. A merchant had a note of $1400, to pay on the 1st of Aug. 1853; he paid it on the 15th of May, 1853; what sum did he pay, interest 7 per cent. per annum? Ans. $1379.61.

67. On making up my accounts on the 1st of July, 1850, I find that I owe two bills; one payable on the 13th of December, 1850, and the other on the 27th of January,

1851. The first is for $1769.20, and the second for $2000; what is the value of the two notes, July 1st, 1850, at 6 per cent. per annum? Ans. $3656.305.

68. A person put a sum of money out at interest for 3 mo. at 7 per cent. per annum, and received for principal and interest £760 15*s.* 8*d.*; what was the sum? Ans. £747 13*s.* 8½*d.*

69. If I receive $20160, which is my own money, and 20 per cent. over; what is my own money? Ans. $16800.

70. What is the present worth of $12000, ½ of which is payable in 6 mo., ⅓ in 10 mo., and the remainder in 15 mo., interest being 9 per cent. per annum? Ans. $11260.31.

71. I owe $500, payable in 2 mo., $350, payable in 6 mo.; what is the present worth of the whole amount, interest 4½ per cent. per annum? Ans. $838.575.

72. A merchant owes $1000, payable on the 15th August, 1853; $500, payable on the 10th of Oct., 1853; $900, payable on the 1st of Nov. 1853; what is the value of the three notes, on the 1st of July, 1853, at 6 per cent. per annum? Ans. $2366.79.

73. There are two notes, one for $162.75, payable 1st. Jan., 1851, and the other for $910, payable May 1st, 1851; what is the value of the two notes on the 1st of March, 1851, interest 7½ per cent. per annum? Ans. $1065.58.

74. What is the difference between the true and bank discount on $7000, payable in 7 mo., at 6 per cent. per annum? Ans. $11.785.

75. What is the difference between the true and bank discount on $10000 payable in 4½ mo., at 8 per cent. per annum? Ans. $15.404.

76. What is the difference between the true and bank discount on £2113 7*s.* 10*d.* payable in 1 yr. 20 days, at 7 per cent. per annum? Ans. £10 15*s.* 11.75*d.*

77. Which is the more advantageous, to buy muslin at 7½ cts. per yd. on 4 mo., or 8 cts. per yd. on 6 mo., at 6 per cent. per annum? Ans. 7½ cts. a yard.

78. After 10 per cent. had been cut from a piece of cloth, there remained 47$\frac{7}{10}$ yd.; how long was the piece of cloth before any was cut off? Ans. 53 yards.

PROFIT AND LOSS.

Art. 223. What is Profit and Loss?

Profit and loss is a rule by which it is found what is gained or lost in various transactions.

Art. 224. To find the profit and loss when the cost and selling prices are given,

Rule.—*Subtract the less sum from the greater; if the cost be the less, the remainder will be the gain; if the cost be the greater, the remainder will be the loss.*

1. A man bought a house for $3725, and sold it for $4000; how much did he make? Ans. $275.

2. Bought a horse for $275.80, and sold him for $262.50; what was lost? Ans. $13.30.

3. A person bought 350 barrels of flour, for which he paid $6 per barrel, and sold them at $7 a barrel; what did he gain? Ans. $350.

4. A man bought a house worth $1100, for 20000 feet of lumber that cost him $42.90 a thousand; what did he make by the exchange? Ans. $242.

5. A sold to B, 150 A. 2 roods of land for $65000; the land cost $300 per acre; how much did A gain? Ans. $19850.

6. A man bought 54 T. 13 cwt. 56 lb. of iron for 2¼ cents per pound, and sold it at $50 a ton; how much did he gain? Ans. $273.39.

7. I exchanged 58 cwt. 2 qr. 21 lb. of iron, which cost $3.20 a cwt., 350 bushels of potatoes, worth 98½ cents a bushel; did I gain or lose, and how much?

Ans. $156.878 gain.

8. A man bought a farm for $1650; he kept it one year, and sold it for $2000; how much did he make, allowing interest at 7 per cent. per annum, while he kept the farm? Ans. $234.50 gain.

9. A person bought 26 hhd. of sugar, averaging 1300 lb. a hhd., for 7 cents a pound; he refined it at an expense of $338; during the process of refining 26 lb. were wasted on each hhd.; he then sold it at 10½ cents a pound; how much did he gain?

Ans. $774.02.

10. Bought 14 hhd. of wine for $1200, and retailed it $2.25 a gallon; allowing 3 gallons for leakage on each hogshead, how much did I gain? Ans. $690 gain.

11. A provision merchant packed 100 hogs, averaging 150 lb. each, at a cost of 9 cents a pound for the pork and 50 cents a head for cutting and packing; how much will he make if he sells the lot at 12½ cents a pound?

Ans. $475 gain.

Art. 225. To find the selling price, when the cost and gain or loss are given,

Rule.—*Add the gain to, or subtract the loss from the cost, and the result will be the selling price.*

Art. 226. To find the cost, when the selling price and he gain or loss are given,

Rule.—*Subtract the gain from, or add the loss to the selling price, and the result will be the cost.*

12. A person bought a house for $5400, and sold it so as to make $429.37½; for how much did he sell it?

Ans. $5829.37½.

13. A person bought a farm for £1612. 13*s* 10½*d*,

and sold it at a sacrifice of £211. 18*s*. 9*d*.; for how much was it sold? Ans. £1400. 15*s*. 1¼*d*.

14. A merchant sold 25 pieces of cloth at $43.75 a piece, and by so doing he lost $229.50; for how much did he buy it? Ans. $1323.25.

15. A person sold 156 A. 3 R. 12 sq. p. of land at $750 per acre, and cleared $14000; how much was the cost? Ans. $103618.75.

16. A merchant bought 325 barrels of pork at $17.50 per barrel, and sold them so as to make 1¼ cents a pound; for how much did he sell the whole?

Ans. $6500.

17. A grocer bought 15 hhd. of sugar, each weighing 13 cwt. 1 qr. 17 lb., at $7.50 per cwt., and sold them so as to make 2½ cents on a pound; for how much was one pound sold, and for how much was the whole sold?

Ans. { 10 cents per pound,
$2013 whole.

18. A merchant sold 73 pieces of linen, each 13 yd. 3 qr. 1 na., for $1000, and thereby gained 25 cents a yard; what did the whole cost?

Ans. $747.921.

Art. 227. To find the gain or loss, when the cost and the gain or loss per cent. are given,

Rule.—*Multiply the cost by the gain or loss per cent., and the product will be the gain or loss.*

19. A person entered into a speculation, in which he invested $7500; he cleared 20 per cent., how much did he make? Ans. $1500.

20. Bought a horse for $306, and sold him at 10 per cent. advance; how much was gained, and what was the horse sold for? Ans. $30.60 gained.
The horse was sold for $336.60.

21. Bought a yard of cloth for $6, and sold it at 16⅔

per cent. profit; what was made on the yard of cloth, and for how much was it sold? Ans. { $1 gained. $7 a yard.

22. A person entered into business with a capital of $2335.50; in one year he augmented it 33⅓ per cent.; what was his capital at the commencement of the following year? Ans. $3114.

23. Bought a hogshead of sugar weighing 1280 lb., at 7½ cents per pound, and sold it at 25 per cent. profit; for how much was it sold?

Ans. $120.

24. What is 37½ per cent. advance on $1385.50?

Ans. $1905.06¼.

25. A person invested £698. 10*s.* 6*d.* in a shipment to Canton, on which he made 112½ per cent.; how much did he gain? Ans. £785. 16*s.* 9¾*d.*

26. Bought a quantity of drugs, amounting to £150. 11s., and sold them at 250 per cent. profit; what was the profit? Ans. £376. 7*s.* 6*d.*

27. A merchant had a stock of goods amounting to $3750; a fire destroyed 66⅔ per cent. of his stock; not being insured, how much did he lose? Ans. $2500.

28. In the previous sum, suppose the merchant was fully insured at selling prices, say 20 per cent. advance on $3750, insurance being 1½ per cent., how much would he make by being burned out, instead of waiting 6 months to sell the same goods at the same advance, when money is worth 7 per cent. per annum?

Ans. $87.637.

29. A cotton factory valued at $8000, and its contents worth $13 500 caught fire; the building was entirely destroyed, and 60 per cent. of the contents were saved; what was the total loss? Ans. $13400.

30. I lent a friend $50 and lost 100 per cent. of it; how much did I receive? Ans. Nothing.

31. A person entered into business with a capital of $2310; in 2 years he increased it 48⅓ per cent.; what was his capital then? Ans. $3426.50.

32. Bought 500 bags of coffee, each bag 49¼ lb., at 12 cts. a pound, and sold the whole at 16⅔ per cent. profit; how much was it sold for? Ans. $3447.50.

33. A merchant bought 375 T. 15 cwt. of wool, at $75 per ton, and sold it so as to make 20 per cent.; for how much per cwt. did he sell it? Ans. 4.50.

34. A grocer bought 410 bu. 3 pk. 4 qt. of potatoes, 96 cts. per bushel; at how much per quart must he sell them so as to make 12½ per cent? Ans $.03⅜.

ART. 228. To find the gain or loss per cent., when the cost and the gain or loss are known,

RULE.—*Consider the gain or loss on a single or a number of articles as the numerator of a fraction, and the cost of the same article or articles as the denominator; reduce both terms of the fraction to the same denomination, and then to hundredths; and the quotient will be the gain or loss per cent.*

35. Bought sugar at 10 cts. per pound, and sold at 12 cts. per pound; how much per cent. was gained?
Ans. 20 per cent.

36. A cow was bought for $40, and sold for $35; how much per cent. was lost? Ans. 12½ per cent.

37. I bought a horse for $320, and sold him for $450; how much per cent. did I make? Ans. 40⅝ per cent.

38. A person bought 20 reams of paper, at $2 per ream, and sold it for 18 cts. per quire; how much per cent was gained? Ans. 80 per cent.

39. A flour merchant bought 300 barrels of flour for $1590, and sold it for $6 per barrel· how much per cent.

did he make on the lot, and how much per cent. did he make on a single barrel? Ans. 13$\frac{1}{5}\frac{1}{3}$ per cent.

40. A person bought a barrel of pork for $11.25, and sold it for $13; how much per cent did he make?
Ans. 15$\frac{5}{9}$ per cent.

41. Bought 3 hhd. of sugar, each 13 cwt. 3 qr. 14 lb., at $8 per cwt., and sold it for 10 cts. per pound; how much per cent. was made?
Ans. 25 per cent.

42. A grocer bought 1 barrel of flour for $6, and sold it at 28 cts. for 7 lb.; how much per cent. did he make?
Ans. 30$\frac{2}{3}$ per cent.

43. A man bought a house for $5000, and sold it for $4225; how much per cent. did he lose?
Ans. 15$\frac{1}{2}$ per cent.

44. An iron dealer bought 45 T. 16 cwt. 25 lb. of iron, at $75 per ton, and sold it for $78.50 per ton; how much, and how much per cent. did he make?
Ans. $\begin{cases} \$160.343 \text{ total gain.} \\ 4\frac{2}{3} \text{ per cent.} \end{cases}$

ART. 229. To find the cost when the selling price and the gain or loss per cent. are given,

RULE.—*Divide the selling price by* 1, *increased by the gain per cent., or diminish by the loss per cent.; the quotient will be the cost or buying price.*

45. A man sold a horse for 315, and made 5 per cent. for how much did he buy him? Ans. $300.

46. A merchant received $450 for the proceeds of a speculation, in which he lost 10 per cent.; how much did he invest? Ans. $500.

47. Sold 20 barrels of flour for 7\frac{1}{2}$ per barrel and made 25 per cent; how much did the 20 barrels of flour cost? Ans. $120.

48. Sold a house for $1250, and lost 4 per cent. by the transaction; how much did the house cost?

Ans. 1302.08\frac{1}{3}$.

49. A grocer sold sugar at 8 cts. a pound, and made 25 per cent.; how much did it cost a pound?

Ans. $.064.

50. Sold 25 firkins of butter, at 25 cts. a pound, and made 12 per cent.; what did the whole cost?

Ans. $312.50.

51. Sold 78 cwt. 3 qr. 14 lb. of sugar, at 8 cts. a pound, and gained 15 per cent.; how much did the whole cost? Ans. $548.80.

52. Sold 160 tierces of rice, each weighing 500 lb., at 7$\frac{1}{4}$ cts. a pound, and gained 20 per cent.; what did the whole cost? Ans. 4833.33\frac{1}{3}$.

53. Sold 3 lots of ground: the first for $275, and made 30 per cent.; the second for $300, and made 50 per cent.; and the third for $500, and made 25 per cent.; what did the three lots cost? Ans. $811.538.

54. Sold a farm, containing 62 A. 3. R. 21 sq. p., for $275 an acre, and cleared 6$\frac{1}{4}$ per cent.; what did the whole cost? Ans. $16275.147.

55. A merchant sold 700 barrels of flour for $4025, and gained 15 per cent.; how much a barrel did the flour cost? Ans $5.

56. A person laid in 25 tons of coal during the summer; in winter the price of coal was $7.10 a ton; by laying it in in summer, he found he had saved 37$\frac{1}{2}$ per cent.; how much did the coal cost?

Ans. $129.09.

57. A flour merchant bought 250 barrels of flour at $5.50 per barrel, and sold the whole for $1875; how much per cent. did he make?

Ans. 36$\frac{4}{11}$ per cent.

58. Bought a pipe of brandy for $2 per gallon, on a

note at 6 *months*, at 7 per cent., and sold it for $2.50 cash per gallon; how much per cent. was gained?

Ans. .27$\frac{6}{10}$ per cent.+.

59. Bought 360 pieces of ribbon at $3.25 a piece, on a note for 7 months, at 6 per cent. per annum, and sold them for $3.50 cash, per piece; how much and how much per cent. was made?

Ans. { $131.53 gain,
11$\frac{3}{5}$ per cent. (nearly.)

ART. 230. When the selling price and the gain or loss per cent. are given, to find the gain or loss per cent. at some other selling price.

RULE.—*Find the cost by means of the given selling price and rate per cent., and then compare the cost and the other selling price, and find the gain or loss per cent. by Art.* (228)

60. A person sold a house for $3000 and gained 50 per cent.; how much per cent. would he have made had he sold it for $2500? Ans. 25 per cent.

61. A farmer sold 20 acres of land for $300 an acre, and gained 25 per cent.; how much per cent. would he have gained or lost had he sold the land for $4000?

Ans. 16$\frac{2}{3}$ per cent. loss.

62. Sold 7800 bushels of rye for 50 cents a bushel, and lost 9 per cent.; how much per cent. would have been gained or lost, had the rye been sold for 60 cents a bushel? Ans. 9$\frac{1}{5}$ per cent. gain.

63. A lumber merchant sold 49500 feet of lumber for $18 per thousand feet, and gained 20 per cent.; how much per cent. would he have made or lost, had he sold at $16 per thousand feet? Ans. 6$\frac{2}{3}$ per cent. profit.

ART. 231. When the selling price and its corresponding gain or loss per cent. are given, to find the selling price at some other gain or loss per cent., RULE.—*Find the cost from the given selling price and its corresponding gain or loss per cent., and to the cost add the other percentage, if it be gain, or subtract, if loss; the result will be the selling price required.*

64. A person sold a barrel of pork for $12, and gained 20 per cent.; for how much would it have sold, had he gained 25 per cent.? Ans. $12.50.

65. A grocer sold coffee at 10 cents per pound, and gained 25 per cent.; for how much must he sell it to gain 12½ per cent.? Ans. 9 cents per pound.

66. A machinist sold an engine for $24000, and lost 4 per cent.; for how much ought he to have sold it to gain 10 per cent.? Ans. $27500.

67. A lumber dealer sold 12000 feet of boards at $31.25 a thousand, and gained 25 per cent.; for how much a thousand would the boards have been sold, had he gained 15 per cent.? Ans. $28.75.

PROMISCUOUS EXAMPLES.

68. A person bought 2 pieces of French broadcloth; the first piece measured 37⅛ aunes, and the second 39¾ aunes; the cloth cost $4.62½ a yard, and was sold for $5 a yard; how much did he make,. counting an aune equal to 1¼ yard? Ans. $36.04.

69. A farmer bought 75⅜ bushels of rye at 37½ cents a bushel, and sold it so as to make 16⅔ per cent.; for how much did he sell the whole? Ans. $32.975.

70. A man bought a horse for $317.77, and sold him for $300; how much per cent. did he lose?

Ans. $5\frac{6}{10}$ per cent.

71. Bought 700 doz. of eggs at 12 cts., and sold them for 12½ cts. a doz.; how much was gained, and how much per cent.?

Ans. { $3.50 gain.
4⅙ per cent.

72. Sold 250 bushels of wheat at 20 shillings a bushel, and gained 10 per cent.; what did the whole cost?

Ans. £227 5*s.* $5\frac{5}{11}$*d.*

73. Sold a hogshead of wine at $\$2\frac{1}{4}$ a gallon, and lost 10 per cent., when it could have been sold at 50 per cent. advance; for how much under its value was the wine sold? Ans. $1.50.

74. Sold a horse for $234, and gained 17 per cent., when he ought to have been sold at 25 per cent. profit; how much above the cost would the latter percentage give? Ans. $50.

75. Bought 3000 bags of sugar, each bag 100 lb., at $6\frac{1}{4}$ cts., per pound on a note for 5 months, at 6 per cent. per annum, and sold the lot at the same price for cash; how much was gained? Ans. $478.125.

76. A person advanced $5000 in uncurrent money, to a contractor who was building a house; on this money there was a discount of $\frac{1}{2}$ per cent.; the next day he received a check for $5000 in payment for what he had lent; how much did he gain? Ans. $25.

77. A flour merchant bought 400 barrels of flour, for $7 cash, a barrel; he sold it for $7\frac{1}{2}$ a barrel, on a note payable in 4 months, at 7 per cent. per annum; how much did he make? Ans. $128.25.

78. A tailor bought 500 yd. of cloth at $\$4.37\frac{1}{2}$ a yard, on a credit of 8 months, at 6 per cent. per annum, and sold the cloth at $4.50 a yard, on a credit of 3 months at the same rate per cent.; how much did he gain, in cash value? Ans. $116.217.

79. A liquor dealer bought a pipe of brandy at $2 a gallon, on a note at 6 months, 7 per cent. per annum and sold it at the same price a gallon, for cash; how much did he gain?

Ans. $8.967.

80. Bought 360 pieces of ribbon at $3.25 a piece for cash; sold the ribbon at $3.50 a piece, on a note pay

able in 7 months, at 5 per cent. per annum; how much was made; and how much per cent.?

Ans. $\begin{cases}\$52.75 \text{ gain.}\\ 4\frac{1}{2}+ \text{ per cent.}\end{cases}$

81. A person bought 3 hhd. of sugar, each hogshead weighed 1412½ lb.; he sold it at 11 cts. a pound, and gained 37½ per cent.; for how much ought it to have been sold, so as to gain 50 per cent., and what did the whole cost? Ans. 12 cts. a pound.

82. A man bought a house, and sold it for $3225, by which he lost 4 per cent.; had he sold it at an advance of 7½ per cent., how much would he have gained?

Ans. $251.953.

83. A cotton broker bought 550 bales of cotton, each bale 723¼ lb.; he sold it at 10 cts. a pound, which was ¼ per cent. advance on the cost; had he waited a few days longer he might have made an extra ⅛ per cent.; for how much would the cotton then have been sold?

Ans. $39828.367.

84. A merchant sold 1500 barrels of pork at $11¼ a barrel on a note for 3 months, at 5½ per cent. per annum; the profit was 20 per cent.; what did the pork cost? Ans. $13862.70.

85. A grocer sold 400 barrels of apples, for $3 a barrel, and lost 4 per cent. by the sale; what did the whole cost? Ans. $1250.

EXCHANGE.

Art. 232. What is Exchange?

Exchange is the method of finding the value of the currency of one country in that of another.

Art. 233. What is the currency of a country?

It is the coins and bills that constitute the money of that country.

ART. 234. What is the rule for Exchange?

The value of a unit of the money of the various countries being known, analysis will supply the rules for most cases.

ART. 235. To reduce sterling money to Federal,

RULE.—*Consider one dollar equivalent to nine sixpences Sterling; then reduce the given amount to sixpences, divide by 9, and to this result add a certain given rate per cent.*

NOTE—The value of a pound sterling is fixed by Congress at $4.84. But among merchants and brokers, when Bills of Exchange are bought or sold, the old par value, 4.44\frac{4}{9}$ to the pound sterling, is taken as the basis of calculation, and to this a certain percentage is added, which is not fixed, but varies with the fluctuations of trade. Nine per cent. is generally the rate, but it is sometimes a little more or less than 9

1. Reduce £18 sterling to Federal money, without premium. Ans. $80.

2. Reduce £45 sterling to Federal money, without premium. Ans. $200.

3. Reduce £100 sterling to Federal money, without premium. Ans. 444.44\frac{4}{9}$.

4. Reduce £384 sterling to Federal money, without premium. Ans. $1706.666+.

5. Reduce £18. 15*s.* sterling to Federal money, without premium. Ans. $83.33.

6. Reduce £711. 14*s.* 6*d.* sterling to Federal money, without premium. Ans. $3163.22.

7. Reduce £144. 19*s.* 10$\frac{1}{2}$*d.* sterling to Federal money, without premium. Ans. $644.416+.

8. Reduce £1. 10*s.* 9$\frac{3}{4}$*d.* sterling to Federal money, without premium. Ans. $6.847.

9. Reduce £2060. 12*s.* 4$\frac{3}{4}$*d.* sterling to Federal money, without premium. Ans. $9158.31.

10. Reduce £112. 14*s*. 1*d*. sterling to Federal money, without premium. Ans. $500.91.

11. Reduce £2. 5*s*. sterling to Federal money, when the premium is 9 per cent. Ans. $10.90.

12. How much Federal money is equal to £15. 1*s*. 6*d*. when the premium is 8 per cent. ? Ans. $72.36.

13. How much Federal money is equal to £80 sterling, when the premium is 10 per cent. ?
Ans. $391.11.

14. How much Federal money is equal to £135 15*s*. 10*d*. English money, when the premium is 8 per cent. ?
Ans. $651.80.

15. Reduce £45 13*s*. 9*d*. English money to Federal, when the premium is 8 per cent. Ans. $219.30.

16. What will £316 11*s*. 2*d*. British money come to in Federal money, when the premium is 9 per cent. ?
Ans. $1533.55.

17. Reduce £439 16*s*. 7*d*. sterling to Federal money, when the premium is 8½ per cent. Ans. $.

18. Reduce £2166 16*s*. 8*d*. sterling to Federal money, when the advance is 8¾ per cent. Ans. .

19. Reduce £15656 19*s*. 1½ sterling to Federal money, when the advance is 9½ per cent.
Ans. $

20. Reduce 17*s*. 6*d*. sterling to Federal money, when the advance is 8¼ per cent. Ans. $.

21. A merchant in Liverpool sold 200 barrels of flour at £2 10*s*. per barrel; how much Federal money will that be, exchange 9 per cent. premium ?
Ans. $2422.22.

22. A cotton broker sent to London 70 bales of cotton, each 867 lb.; it was sold at 10*d*. per lb.; for how much Federal money was it sold, premium 9 per cent., and what was his commission at 5 per cent. ?

Ans. $\left\{\begin{array}{l}\text{\$12250.39.}\\ \text{\$612.52 commission.}\end{array}\right.$

23. Shipped to Liverpool, 2000 barrels of flour, which cost in New York $4.50 per barrel; it was sold at £1 18*s.* 6*d.* per barrel, when the premium was 8½ per cent.; how much was the gain? Ans. $9565.55.

24. A grain dealer bought 10 000 bushels of corn, at 38⅜ cts. a bushel. He sent it to London, where it brought 28*s.* 9*d.* a quarter, when the premium was 9½ per cent.; the cost of transportation was 12½ cts. per bushel; how much was gained? Ans. $3657.29.

25. If 14 bu. 3 pk. 5 qt. are sold at £2 10*s.* 6*d.* per bushel; how many dollars Federal money will that be, exchange 8¾ per cent. advance? Ans. £

26. How much Federal money will pay for 135 cwt. 3 qr. 14 lb. of sugar, at 35*s.* sterling per cwt., premium 10½ per cent.? Ans. $1167.90.

27. A person in Boston received £1000 sterling, from England, when the premium was 9 per cent. He put it out at interest for 9 mo. 18 da. at 6 per cent. per annum; to how much did it amount? Ans. $5076.98.

28. If £459 18*s.* sterling is put at interest for one year, at 5 per cent. per annum, when the premium is 8 per cent., to how much Federal money will it amount?
Ans. $2317.90.

29. There were sent from Louisiana to England 420 hhd. of sugar, each 1250 lb.; the tare was 5 per cent.; the sugar sold at 8*d.* a pound, when the rate of exchange was 9 per cent; what was the amount in Federal money?
Ans. $80538.89.

30. Reduce 25000 francs to dollars, at 5 francs 15 centimes to the dollar. Ans. $4854.38.

31. A person received from Paris a bill of exchange for 52000 francs, 18¾ cts. to the franc. He put it at interest for 3 mo. at 7 per cent. per annum; to how much did it amount? Ans. $9735.44.

32. How much Federal money in 695 guineas, when the premium is 8½ per cent.? Ans. $3519.02.

33. How many francs 18⅗ cts. each, will it take to pay £1054 9*s*. 4¼*d*., when the premium is 9¼ per cent.?
Ans. 27526.99+ francs.

34. What is the value, in Federal money, of £1 sterling, when the premium is 9 per cent.?
Ans. $4.84⁴⁄₉.

35. What is the value, in Federal money, of £1 sterling, when the premium is 8 per cent.?
Ans. $4.80.

36. Reduce £1, English money, to Federal money, when the rate of exchange is 10 per cent.
Ans. $4.88⁸⁄₉.

37. Reduce £1 sterling, to Federal money, when the exchange is 7 per cent. advance. Ans. $4.75⁵⁄₉.

38. What is the value, in Federal money, of £1 sterling, when the advance is 7½ per cent.?
Ans. $4.77⁷⁄₉.

39. What is the value, in Federal money, of £1 sterling, when the premium is 8¾ per cent.?
Ans. $4.83⅓.

Art. 236. To reduce Federal money to English, or sterling money,

Rule.—*Divide the given amount in Federal money, by the value of* £1 *sterling.*

40. Reduce $100, to sterling money, when the exchange is 8 per cent. premium.
Ans. £20 16*s*. 8*d*.

41. Reduce $725.50, to sterling money, when the rate of exchange is 8 per cent.
Ans. £151 2*s*. 11*d*.

42. What is the value in sterling money, of $150, when the rate of exchange is 9 per cent.?
Ans. £30 19*s*. 3*d*.

43. What is the value in sterling money, of $3500, when the premium is 8½ per cent.?
Ans. £725 16*s.* 1½*d.*

44. How much English money is equivalent to $864.20, when the premium is 8¾ per cent.?
Ans. £178 16*s.*

45. When the premium on sterling money is 9½ per cent., what is the value of $1.25? Ans. 5*s.* 1½*d.*

46. When the premium on sterling money is 7 per cent., what is the value of $14286.75?
Ans. £3004 4*s.* 5½*d.*

47. A person who was going from New York to Liverpool, exchanged $2400, to English money, when the premium was 8 per cent. How many pounds did he get? Ans. £500.

48. A merchant bought 400 barrels of flour at $10½ per barrel; he sent the whole to London, where it sold at an advance of 20 per cent., when the exchange was 10 per cent.; how much did he gain in sterling money?
Ans. £859 1*s.* 9¾*d.*

PROPORTION.

Art. 237. What is a Ratio?

Ratio is the quotient that is produced by dividing one quantity by another of the same kind.

Art. 238. What is a proportion?

A proportion is two or more equal ratios.

Art. 239. Of how many terms does the rule of proportion consist?

It consists of four terms; three of which are always given, and the fourth is to be found from the three terms given.

Art. 240. What separate the different terms of a proportion ?

Two points, thus, :, *separate the first and second terms ; four points, thus,* : :, *the second and third ; and two, thus,* :, *the third and fourth.*

Art. 241. What is the meaning of these points ?

The two denote division, and the four denote equality ; that is, the quotient of the first term divided by the second, is equal to the quotient of the third divided by the fourth.

Art. 242. What are the first and fourth terms called ?

Extremes.

Art. 243. What are the second and third terms called ?

Means.

Art. 244. What are the first and third terms called ?

Antecedents.

Art. 245. What are the second and fourth terms called ?

Consequents.

Art. 246. What are the two methods of proving the correctness of a proportion ?

1*st. If the product of the extremes is equal to the product of the means, the proportion is correct.*

2*d. If the quotient of the first term by the second is equal to the quotient of the third by the fourth, the proportion is correct.*

Art. 247. To supply any one term of a proportion, when three terms are known,

Rule.—*If it be a mean, divide the product of the ex-*

tremes by the known mean; if it be an extreme, divide the product of the means by the known extreme.

Art. 248. To state a sum in proportion,

Rule.—*Make that quantity which is of the same name or kind as the answer, the third term; then consider from the other two given terms, whether the fourth term or answer is to be more or less than the third term; if more, place the greater of the other two given terms in the second place, and the remaining one in the first; if less, place the smaller of the other two given terms in the second place, and the remaining one in the first.*

Art. 249. To find the fourth term, or answer, after the statement is made,

Rule.—*Reduce the first and second terms to the same denomination, and the third term to a single denomination; then multiply the second and third terms together, and divide their product by the first term; the quotient will be the fourth term or answer, and will be of the same denomination as the third term, or that to which the third term was reduced.*

Note.—To read a proportion, like 7 : 14 : : 3 : 6, say, as 7 is to 14, so is 3 to 6.

1. Is 2 : 4 : : 8 : 16 a correct proportion ?
2. Is 3 : 2 : : 6 : 4 a correct proportion ?
3. Is 5 : 11 : : 6¼ : 13¾ a correct proportion ?
4. Is 6 : 16 : : 8 : 18 a correct proportion ?
5. Is 12 : 20 : : 13 : 21 a correct proportion ?
6. Is 16 : 12 : : 88 : 66 a correct proportion ?
7. Is 758 : 345 : : 14 : 6 a correct proportion ?
8. Is 3120 : 17180 : : 13 : 72 a correct proportion ?
9. Supply the 4th term in 4 : 8 : : 32 :
10. Supply the 1st term in — : 75 : : 25 : 10.

11. Supply the 2d term in 15 : — : : 45 : 120.

12. Supply the 3d term in 40½ : 162 : : — : 81.

13. If 2 lb. of coffee cost 36 cents, what will 14 lbs. cost? Ans. $2.52.

14. If 3 lb. of butter cost 54 cents, what will 2 lb. cost? Ans. 36 cents.

15. If 7 bushels of wheat cost $6.20, what will 42 bushels cost? Ans. $37.20.

16. If 12 acres of land cost $726, what will 38 acres cost? Ans. $2299.

17. If 29 barrels of flour cost $68.97, what will 43½ barrels of flour cost? Ans. $103.45½.

18. If 30 tons of iron cost $650, what will 12 T. 10 cwt. cost? Ans. $270.83⅓.

19. If 28 barrels of cider cost $140, what will 1½ barrels cost? Ans. $7.50.

20. If 17 gallons of oil cost £8 15*s*. what will 42½ gallons cost? Ans. £21 17*s*. 6*d*.

21. If 100 lb. of butter cost £10, what will one pound cost? Ans. 2 shillings.

22. If a ship can sail 312 miles in one day, how far will it sail in 12½ days, supposing it sails at the same rate? Ans. 3900 m.

23. If 25 square yards of oil cloth cost £7 10*s*., what will 14¾ square yards cost? Ans. £4 8*s*. 6*d*.

24. If you can buy 13 cords of wood for $84.50, how many cords can you buy for $21.12½? Ans. 3¼ cords.

25. How many feet of lumber can be bought for $78.50, at the rate of $25 per thousand? Ans. 3140 feet.

26. If a horse can run 40′ of a circle in 3 seconds, how long will it take him to run the whole circle? Ans. 27 min. of time.

27. If 4 bu. 3 pk. cost \$10.50, what will 75 bushels cost? Ans. \$165.78$\frac{18}{19}$.

28. If 12 lb. 3 oz. of gold cost \$2400, what will 21 ounces cost? Ans. \$342.85$\frac{5}{7}$.

29. If 31 cwt. 1 qr. 14 lb. of sugar cost \$318.45, what will be the price of a hogshead that weighs 1240 pounds? Ans. \$125.80.

30. If 12 A. 3 R. 28 sq. p. of land cost \$2460, how many acres can be bought for \$10 000?
Ans. 52 A. 2 R. 6 sq. p. 15$\frac{61}{246}$ sq. yd.

31. 350 men have provision enough to last 4 mo. 15 days; how long would the same provisions last 240 men? Ans. 6 mo. 16$\frac{7}{8}$ days.

32. If you can buy 44 gross of pens for £53 12*s*., how many gross can be bought for £12 18*s*. 6*d*.?
Ans. 10$\frac{327}{536}$ gross.

33. If it take 20 men 112 days to dig a sewer, how long will it take 48 men to dig the same sewer?
Ans. 46$\frac{2}{3}$ da.

34. A corn merchant sent 1400 bushels of corn to London and sold them for £210; he afterwards sent 10500 bushels, and received the same price per bushel; for how much did he sell the second lot of corn?
Ans. £1575.

35. If 37 bushels cost \$112.87$\frac{1}{2}$, how many bushels can be bought for \$300?
Ans. 98 bu. 1 pk. 2$\frac{254}{301}$ qt.

36. If 3$\frac{3}{8}$ gallons of molasses cost 80 cents, how many hogsheads can be bought for \$3120.80?
Ans. 208$\frac{55}{56}$ hhd.

37. If 34 men can build a house in 40 days, how long will it take 12 men to build the same house?
Ans. 113$\frac{1}{3}$ days.

38. A farmer can plough 3 roods and 12 square rods

of land in 1 day; how long will it take him to plough 5 acres? Ans. $6\frac{2}{33}$ days.

39. If $42\frac{1}{2}$ tons of coal cost $206.20, what will be the price of $1\frac{3}{4}$ tons? Ans. 8.49\frac{1}{17}$.

40. If \$$17\frac{3}{4}$ will buy provisions to last 8 months, how much will it take to buy provisions for 18 months? Ans. \$$39.93\frac{3}{4}$.

41. If a man perform a piece of work in 20 days, when he works 10 hours per day, how long will it take, if he works 12 hours a day? Ans. $16\frac{2}{3}$ days.

42. If 24 yd. 3 qr. of carpet, which is one yard wide, will cover a room, how long must the carpet be, that is $1\frac{3}{4}$ yards wide, to cover the same room? Ans. $14\frac{1}{7}$ yd.

43. If $18\frac{3}{4}$ bags of coffee contain $758\frac{1}{2}$ pounds, how many pounds will 300 bags contain? Ans. 12136 lb.

44. How long will it take a person to travel 1290 miles, at the rate of $306\frac{3}{4}$ miles in $20\frac{1}{2}$ days? Ans. $86\frac{86}{409}$ days.

45. If $17\frac{7}{9}$ cords of wood cost \$$88\frac{8}{9}$, what will $254\frac{3}{4}$ cubic feet cost? Ans. $9.95.

46. If $38\frac{3}{10}$ cwt. of tobacco cost \$$114\frac{2}{3}$, what will 13 tons $15\frac{1}{2}$ cwt. cost? Ans. $822.90.

47. If $43\frac{3}{4}$ cords of wood cost £92 $12\frac{3}{4}$*s.*, how many cords can be bought for £$63\frac{2}{5}$? Ans. 29 c. 121 cu. ft.

48. If $7\frac{7}{11}$ barrels cost \$$31\frac{1}{9}$, what will $32\frac{2}{5}$ barrels cost? Ans. $132.

49. If 2 bu. 1 pk. of wheat cost \$$1.93\frac{3}{4}$, how many bushels can be bought for \$$96\frac{7}{8}$? Ans. $112\frac{1}{2}$ bushels.

50. If it cost \$$1.38\frac{1}{2}$ per square foot to pave a floor $38\frac{3}{4}$ feet long by 25 feet wide, what will it cost to pave a floor 31 feet long by $22\frac{1}{2}$ feet wide? Ans. $966.04.

51. What will it cost to pave a floor $49\frac{3}{8}$ feet by $27\frac{1}{8}$ feet wide, at $1.45 per square foot? Ans.

52. If 18 men can build a house in 30.75 days, how long would it take 32 men? Ans.

53. If 44.3 square yards cost $72.25, what will be the price of 37.09 yards? Ans.

54. If one bottle holds 1.875 pints, how many bottles will it take to hold 2.5 hhd.? Ans.

55. If $17\frac{1}{2}$ bushels cost £8.75, what will 300.16 bushels cost? Ans.

56. If 1425.6 bags of coffee, each bag weighing 62.5 pounds, cost $12080, what will 718.75 pounds cost?
Ans.

57. If 456 barrels beef last a garrison for $66\frac{2}{3}$ days, how long will 89.4375 barrels last them?
Ans. 13 days.

58. If a man can walk 89.4375 miles in $4\frac{1}{4}$ days, how many miles can he walk in $43.4\frac{3}{10}$ days?
Ans.

59. A person has a sum of money at interest, which yields $560, at the rate of 7 per cent. per annum; what rate per cent. per annum must he charge, so as to receive $1000? Ans. $12\frac{1}{2}$ per cent.

60. $6400 put at interest for 1 year at the rate of $7\frac{1}{2}$ per cent. per annum, yields $480; at what rate per cent. per annum must $9000 be put at interest, so as to yield the same sum? Ans. $5\frac{1}{3}$ per cent.

61. If 14 men can be boarded for 1 week for $45.50, what will it cost to board 5 men and 4 women, for one week; the women being boarded at half price?
Ans. $22.75.

62. If 75 tons of iron cost $5400, what will 35 T. 16 cwt. 1 qr. 14 lb. cost? Ans.

63. If 13 T. 11 cwt. 1 qr. 22 lb. of iron cost $880, what will 5 tons cost? Ans.

64. If 17 tons of iron cost $1224, how many tons may be bought for $3811.50? Ans.

65. What will 300 barrels of pork cost, at the rate of $11\frac{1}{4}$ cents a pound, counting 200 lb. to the barrel?
Ans.

66. What will be the cost of 38311 feet of boards at £7 16*s.* per 1000 feet? Ans.

67. What will be the cost, in Federal money, of 369 yd. 3 qr., at 3*s.* 9*d.* New York currency for $2\frac{1}{2}$ yards?
Ans. 69.33.

68. What will be the cost, in Federal money, of 386 bu. 1 pk. 4 qt. of barley, at £1 11*s.* 6*d.* sterling, for 5 bu. 2 pk., exchange 9 per cent.? Ans. $536.01.

69. What will a piece of French cloth, $43\frac{1}{4}$ metres long, cost at £1 10*s.* sterling, a yard; the metre being counted $1\frac{1}{12}$ yd., and the premium 8 per cent.?
Ans. $337.35.

70. How many yards of cloth may be bought for £150 sterling, premium 10 per cent., at the rate of $18.24 for 5 yards? Ans. $201\frac{4}{171}$ yd.

71. How many yards of cloth may be bought for $398.60, at the rate of £5 11*s.* 8*d.* sterling, for $3\frac{1}{2}$ yards, exchange 9 per cent.? Ans. 51 yd. 2 qr. 1 na.

COMPOUND PROPORTION.

Art. 250. What is Compound Proportion?

A compound proportion is a combination of two or more proportions.

Art. 251. To state a sum in compound proportion,

1*st. Place that quantity in third term which is of the same name or kind as the answer;*

2*d. Take any two of the remaining terms that are of the same name or kind and determine from them, whether* *the answer will be more or less than the third term, and place them in the form of a ratio, as directed in simple proportion; then take other two like terms and arrange them as a second ratio under the first; so proceed till all the terms are employed.*

ART. 252. To find the fourth term,

RULE.—*Reduce the third term to one denomination, and if the two terms of any ratio be of different denominations, reduce them to the same; then multiply the third term and all the second terms together, and divide this product by the product of all the first terms; the quotient will be the answer.* Or,

When the terms are all reduced, form a sum in simple proportion by taking the first ratio and the third term; make the fourth term thus found, a third term to the second ratio, and from this find a fourth, and so proceed to the last ratio, when the fourth term will be the answer.

NOTE.—If the operations to be performed are *indicated*, by using the signs of multiplication and division, the work can often be abbreviated by canceling.

1. If it cost $40 to board 3 men for 5 weeks, what will it cost 12 men to board for 10 weeks? Ans. $320.

2. If 18 men can consume 34 barrels of provisions in 135 days, how long will it take 45 men to consume 102 barrels of provisions? Ans. 162 days.

3. What will be the charge for the tuition of 14 boys for 18½ months, if 12 boys are charged $2000 for one year? Ans. $3597.22

4. If 120 men can build a ½ mile of wall in 15¼ days, how many men would it require to build a wall 352 yards long, in 40⅔ days? Ans. 18 men.

5. If 200 men can build 125 rods of railroad in 30 days, how many men would it require to build 25 miles in 80 days? Ans. 4800 men.

6. If 13 men can earn £63 13*s.* in $3\frac{1}{8}$ weeks, how much will 39 men earn in 212 days, counting 6 days to a week? Ans. £2159.

7. If a load containing 18 cwt. 50 lb., be carried $5\frac{1}{2}$ miles for $7.20, what will be the charge for carrying 112 T. 15 cwt. $62\frac{1}{2}$ miles? Ans. $9972.97.

8. If the board of 64 persons for 13 weeks is $2704, what will it cost to board 19 men $5\frac{1}{2}$ weeks?
Ans. $339.625.

9. If 75 horses eat $3\frac{3}{4}$ tons of hay in $7\frac{1}{2}$ weeks, how much will 40 horses eat in 140 days?
Ans. $5\frac{1}{3}$ tons.

10. If 6 apprentices can earn £75 12*s.* in $27\frac{1}{2}$ weeks, by working 2 hours a day at overwork, how much could 15 apprentices earn in $41\frac{1}{4}$ weeks, working $1\frac{1}{2}$ hours a day at overwork? Ans. £212 12*s.* 6*d.*

11. When flour is $6.50 per barrel the ten cent loaf weighs 2.125 pounds, how much will the 5 cent loaf weigh when flour is $7.25 per barrel?
Ans. $\frac{221}{232}$ lb.

12. If it cost $$2.37\frac{1}{2}$ to paint a surface 15 feet long and $13\frac{1}{8}$ feet wide, how much will it cost to paint a surface 250 feet long and $10\frac{3}{5}$ feet broad?
Ans. $31.97.

13. If the interest of $6.50 for 3 yr. $10\frac{1}{2}$ mo. be $104.15, what will be the interest of $$445.62\frac{1}{2}$ for 7 years?
Ans. $128.99.

14. If 20 men, working 11 hours a day for 35 days, can earn $3250, how much can 36 men earn in 43 days, working $10\frac{1}{2}$ hours a day? Ans. $6860.45.

15. If 10 can mow $14\frac{2}{7}$ acres in $4\frac{1}{2}$ days, by working $8\frac{1}{2}$ hours per day, how many men can mow 20 acres in $5\frac{5}{6}$ days, working $3\frac{2}{5}$ hours per day? Ans. 27 men.

16. If 20 men, working 10 hours a day for 38.5 days, build a wall 90 feet long, 6 feet high, 4 feet thick, how

long will it take 75 men to build a wall 325 feet long, 4$\frac{2}{15}$ feet high, and 3$\frac{1}{5}$ feet thick, working 11 hours a day?

Ans. 18 $\frac{2}{3}$ days.

PRACTICE.

Art. 253. What is Practice?

Practice is a method of finding the value of various articles by means of aliquot parts of a unit whose value is given.

Art. 254. What are aliquot parts?

They are parts that always have a unit in the numerators, and a whole number in the denominator.

TABLE OF ALIQUOT PARTS.

10*s*.	= £$\frac{1}{2}$	50	cents	= 4*s*.	= \$$\frac{1}{2}$	N.Y.
6*s*. 8*d*.	= £$\frac{1}{3}$	33$\frac{1}{3}$	"	= 2*s*. 8*d*.	= \$$\frac{1}{3}$	"
5*s*.	= £$\frac{1}{4}$	25	"	= 2*s*.	= \$$\frac{1}{4}$	"
4*s*.	= £$\frac{1}{5}$	20	"	=	= \$$\frac{1}{5}$	"
3*s*. 4*d*.	= £$\frac{1}{6}$	16$\frac{2}{3}$	"	= 1*s*. 4*d*.	= \$$\frac{1}{6}$	"
2*s*. 6*d*.	= £$\frac{1}{8}$	12$\frac{1}{2}$	"	= 1*s*.	= \$$\frac{1}{8}$	"
2*s*.	= £$\frac{1}{10}$	8$\frac{1}{3}$	"	= 8*d*.	= \$$\frac{1}{12}$	"
1*s*. 8*d*.	= £$\frac{1}{12}$	6$\frac{1}{4}$	"	= 6*d*.	= \$$\frac{1}{16}$	"
1*s*. 4*d*.	= £$\frac{1}{15}$	4$\frac{1}{6}$	"	= 4*d*.	= \$$\frac{1}{24}$	"
1*s*.	= £$\frac{1}{20}$	3$\frac{1}{8}$	"	= 3*d*.	= \$$\frac{1}{32}$	"

6*d*. = $\frac{1}{2}$*s*.	16 cwt. = $\frac{1}{2}$ ton.	
4*d*. = $\frac{1}{3}$*s*.	5 " = $\frac{1}{4}$ "	2 qr. = $\frac{1}{2}$ cwt.
3*d*. = $\frac{1}{4}$*s*.	4 " = $\frac{1}{5}$ "	1 " = $\frac{1}{4}$ "
2*d*. = $\frac{1}{6}$*s*.	2 " = $\frac{1}{10}$ "	12$\frac{1}{2}$ lb. = $\frac{1}{2}$ qr.
1$\frac{1}{2}$*d*. = $\frac{1}{8}$*s*.	1 " = $\frac{1}{20}$ "	6$\frac{1}{4}$ " = $\frac{1}{4}$ "
1*d*. = $\frac{1}{12}$*s*.		3$\frac{1}{8}$ " = $\frac{1}{8}$ "
	2 qr. = $\frac{1}{2}$ cwt.	
	1 " = $\frac{1}{4}$ "	

ART. 255. What is the general rule for Practice?

RULE.—*Find the value of the given sum or quantity at the rate of some unit of value, as a shilling, pound, or dollar, &c.; then multiply this value by as many shillings, pounds, or dollars, &c., as there are in the price of a unit whose value is given, and separate the residue into aliquot parts of a shilling, pound, or dollar, &c., and find the value accordingly; add the several results, and their sum will be the total value. If the given sum or quantity consist of several denominations, multiply the value of a unit by as many as there are of those units, and separate the smaller denominations into aliquot parts of some higher whose value is known, and add as before.*

NOTE.—When the price is separated into aliquot parts, the answer will be of the same denomination as the unit of which aliquot parts were first taken; otherwise it will be of the same denomination as that of the unit whose value is given.

1. How much will 725 bushels of rye cost at 25 cents a bushel? Ans. $181.25.

2. What will be the price of 1866 pounds of coffee at 16⅔ cents a pound? Ans. $311.

3. What is the cost of 1951 gallons of oil at $1.33⅓ a gallon? Ans. 2601.33⅓.

4. What is the value of a hogshead of sugar, weighing 1505 pounds, at 8⅓ cents a pound? Ans. $125.42.

5. What will be the value of 759 yards of cloth at $4.75 a yard? Ans. $

6. What cost 987 pounds of tea at 82½ cents a pound? Ans. $

7. What is the price of 1500 bushels of corn at 93¾ cents a bushel? Ans. $

8. How much will 1683 yards of muslin cost at 81¼ cents a yard? Ans. $

9. What cost 1896 yards of muslin at 91⅔ cents a yard? Ans. $.

10. How many dollars will 225 pounds of coffee cost at 1*s*. 4*d*. a pound? Ans. $37.50.

11. How many dollars will 866 yards of muslin cost at 2*s*. 8*d*. a yard? Ans. $288.66⅔.

12. Find how many dollars 361 pounds of tea will cost at 5*s*. 4*d*. a pound. Ans. $

13. What will be the price, in dollars, of 791 gallons of oil, at 6*s*. 8*d*. a gallon? Ans. $

14. How many dollars will 3000 bushels of corn cost, at 5*s*. 8½*d*. a bushel? Ans. $

15. What is the value of 100 pounds of sugar at 6 pence a pound? Ans. £2 10*s*.

16. What is the value of 250 pounds of sugar at 4 pence a pound? Ans. £4 13*s*. 4*d*.

17. What is the value of 306 pounds of coffee at 9 pence a pound? Ans. £11 9*s*. 6*d*.

18. What is the value of 1575 pounds of beef at 11 pence a pound? Ans. £72 3*s*. 9*d*.

19. What is the value of 2839 yards of muslin at 4½ pence a yard? Ans. £53 4*s*. 7*d*½.

20. What is the value of 2354 yards of muslin at 7½ pence a yard? Ans. £73 11*s*. 3*d*.

21. What is the value of 3967 yards of calico at 8¼ pence a yard? Ans. £136 7*s*. 3*d*. 3*qr*.

22. What is the value of 5888 yards of gingham at 10¾ pence a yard? Ans. £263 14*s*. 8*d*.

23. What is the value of 6859 pounds of tea at 11¾ pence a pound? Ans. £335 16*s*. 1¼*d*.

24. What is the value of 98655 yards of muslin at 1*s*. 8*d*. a yard? Ans. £8221 5*s*.

25. What is the value of 16798 yards of muslin at 2*s*. 5*d*. a yard? Ans. £2029 15*s*. 2*d*.

26. What is the value of 5699 pounds of cloves at 4 shillings a pound? Ans. £1139 16*s.*

27. What is the value of 3486 yards of cloth at 15 shillings a yard? Ans. £2614 10*s.*

28. What is the value of 7961 yards of cloth at 17 shillings a yard? Ans. £6766 17*s.*

29. What is the value of 6875 yards of cloth at 19 shillings a yard? Ans. £6531 5*s.*

30. What is the value of 9675 yards of satin at 12*s.* 6*d.* a yard? Ans. £6046 17*s.* 6*d.*

31. What is the value of 9110 yards of silk at 13*s.* 4*d.* a yard? Ans. £6073 6*s.* 8*d.*

32. What is the value of 7568 yards of silk at 16*s.* 8*d.* a yard? Ans. £6306 13*s.* 4*d.*

33. What is the value of 16998 yards of silk at 18*s.* 4*d.* a yard? Ans. £15581 10*s.*

34. What is the value of 5386 boxes of oranges at 15*s.* 9½*d.* a box? Ans. £4252 13*s.* 11*d.*

35. What is the value of 7129 boxes of raisins at 17*s.* 6¾*d.* a box? Ans. £6260 3*s.* 0¾*d.*

36. What is the value of 18659 bushels of potatoes at 14*s.* 11½*d.* a bushel? Ans. £13955 7*s.* 6½.

37. What is the value of 6759 bushels of corn at 18*s.* 8¾*d.* a bushel? Ans. £6329 10*s.* 5¼*d.*

38. What is the value of 7667 pieces of ribbon at 19*s.* 5¾*d.* a piece? Ans. £7467 6*s.* 9¼*d.*

39. What is the value of 681 pieces of cloth at £1 13*s.* 4*d.* a piece? Ans. £1135.

40. What is the value of 9561 pieces of bombazine at £2 10*s.* 4*d.* a piece? Ans. £24061 17*s.*

41. What is the value of 5671 pieces of satin at £3 9*s.* 8*d.* a piece? Ans. £19753 19*s.* 8*d.*

42. What is the value of 4756 pieces of cloth at £5 16*s.* 7*d.* a piece? Ans. £27723 10*s.* 4*d.*

43. What is the value of 987 pieces of cloth at £4 15*s.* 3*d.* a piece? Ans. £4700 11*s.* 9*d.*

44. What is the value of 398 pieces of silk at £8 13*s.* 9½*d.* a piece? Ans. £3458 9*s.* 1*d.*

45. What is the value of 886 pieces of silk at £9 6*s.* 7¼*d.* a piece? Ans. £8266 11*s.* 3½*d.*

44. What is the value of 1921 boxes of citron at £7 11*s.* 5½*d.* a box? Ans. £14547 11*s.* 5½*d.*

47. What is the value of 5 cwt. 2 qr. 12½ lb. of sugar, at $7.50 a cwt.? Ans. $42.18¾.

48. What is the value of 18 cwt. 3 qr. 12½ lb. of sugar, at $6.80 a cwt.? Ans. $128.35.

49. What is the value of 21 cwt. 1 qr. 18 lb. of tobacco, at $8.75 a cwt.? Ans. $187.5125.

50. What is the value of 17 T. 15 cwt. 2 qr. 12½ lb. of iron, at $75 a ton? Ans. $1333.593.

51. What is the value of 26 T. 18 cwt. 3 qr. 22 lb. of copper, at $245.20 a ton? Ans. $6607.7625.

52. What is the value of 17 cwt. 2 qr. 17 lb. of iron, at $84.75 a ton? Ans. $74.876+.

53. What is the value of 13 cwt. 1 qr. 24 lb. of cheese, at $225 a ton? Ans. $151.77.

54 What is the value of 71 A. 2 R. 15 sq. p., at $325.50 an acre? Ans.

55. What is the value of 615 A. 3 R. 32 sq. p., at $164.80 an acre? Ans.

56. What is the value of 28 lb. 7 oz. 16 dwt. of silver, at $13.50 a pound? Ans.

57. What is the value of 43 bu. 2 pk. 7 qt. of corn, at 58 cts. a bushel? Ans.

58. What is the value of 19 hhd. 28 gal. 3 qt. of molasses, at $28.30 a hhd.? Ans.

59. What is the value of 16 cwt. 2 qr. 10 lb. of sugar, at $5 a cwt.? Ans.

60. What is the value of 41 cwt. 3 qr. 17 lb. of iron, at £25 a ton? Ans. £52 8*s*.

61. What is the value of 37 A. 3 R. 15 sq. p., at £47 an acre? £1778 13*s*. 1¼*d*.

62. What is the value of 12 lb. 10 oz. 14 dwt. of gold, at £63 12*s*. a pound? Ans. £819 18*s*. 2.4*d*.

63. What is the value of 15 yd. 3 qr. 3 na. of cloth, at £1 17*s*. a yard? Ans. £29 9*s*. 8¼*d*.

CUSTOM-HOUSE BUSINESS.

Art. 256. What is Gross Weight?

Gross weight is the total weight of any article, together with the hogshead, box, or bag, &c.

Art. 257. What is tare?

Tare is an allowance made for the weight of the hogshead, box, or bag, &c., in which merchandise is transported from one place to another.

Art. 258. What is draft or tret?

It is an allowance made for waste or impurities, leakage, &c.

Art. 259. What is net weight?

Net weight is the actual weight of the article itself.

Art. 260. To find the net weight,

Rule.—*First deduct the draft or tret, and from the remainder subtract the tare; this remainder will be the net weight.*

1. A merchant bought a hogshead of sugar which

weighed 1350 pounds: the tare was 13 pounds; what was the net weight? Ans. 1337 pounds.

2. Bought 14 hogsheads of sugar weighing 1250 pounds each; if the tare is 15 pounds a hogshead, what is the net weight of the whole? Ans. 17290 lb.

3. A grocer bought 100 tierces of rice, each weighing 250 pounds; what is the net weight, the tare being 5 per cent.? Ans. 23750 lb.

4. A tobacconist bought 12 hogsheads of tobacco, each weighing 15 cwt. 2 qr. 11 lb., tare 50 pounds per hogshead; what was the net weight? Ans. 18132 lb.

5. Bought 250 bags of coffee, each bag 73 lb., tare 4 per cent.; what was the net weight? Ans. 17520 lb.

6. What is the price of 45 hhd. of sugar, each weighing 12 cwt. 0 qr. 15 lb., at $8\frac{3}{4}$ cts. per pound; tare 7 per cent.? Ans. $4449.178+.

7. What is the price of 5 casks of wine, marked as follows:—

1st. cask 148 gallons.
2d. " 153 "
3d. " 152 "
4th. " 145 "
5th. " 149 "

The leakage is 2 per cent., and the price $\$2\frac{1}{4}$ per gallon? Ans. $1647.135.

8. A grocer bought 5 hhd. of sugar, each averaging 13 cwt. 1 qr. 12 lb., at $7\frac{1}{4}$ cts. a pound; the draft was $1\frac{1}{2}$ lb. per cwt., and the tare 5 per cent.; what is the price of the net weight? Ans. $469.165+.

9. Received from Rio Janeiro, an invoice of 450 bags of coffee, averaging 76 lb. per bag. The tare was 3 per cent., and the invoice price $10\frac{1}{2}$ cts. per lb. If the coffee is sold at a profit of $33\frac{1}{3}$ per cent., what will be the selling price per pound, and how much will be the total profit? Ans. { 14 cts.
$1161.09 total gain.

10. A grocer bought at auction, 4 hhd. of sugar, each weighing 11 cwt. 2 qr. 20 lb. The tare was 12½ per cent., what was the price of the net weight at 8½ cts. per lb.? Ans. $348.08.

11. A sugar refiner bought 5 hhd. of Louisiana sugar, weighing as follows: 1st., 11 cwt. 1 qr. 14 lb., tare 23 lb. 2d., 12 cwt. 0 qr. 16 lb., tare 25 lb. 3d., 10 cwt. 3 qr. 21 lb., tare 22 lb. 4th., 12 cwt., tare 24 lb. 5th., 13 cwt. 1 qr. 12 lb., tare 26 lb. What was the price of the net weight, at $9.50 per cwt.? Ans. $557.46.

12. A grocer bought 6 cases of sugar, weighing as follows: the 1st., 5 cwt. 3 qr. 15 lb. 2d., 6 cwt. 1 qr. 3d., 5 cwt. 2 qr. 14 lb. 4th., 4 cwt. 3 qr. 20 lb. 5th., 7 cwt., and the 6th., 5 cwt. 1 qr. 7 lb. The tare was 15 lb. per cwt. What was the price of the net weight at $8 per cwt.? Ans. $238.408.

DUTIES.

Art. 261. What are Duties?

Duties are certain amounts levied by government on articles imported, for the purpose of defraying its expenses.

Art. 262. How many kinds of duties are there?

Two: specific and ad valorem duties.

Art. 263. What is a specific duty?

It is a duty imposed on articles according to their weight or measure, without regard to cost.

Art. 264. What is ad valorem duty?

It is a duty imposed on articles according to their value, and is generally reckoned by percentage.

Note.—*Specific duty* is imposed on the net weight; *ad valorem* duty, on the invoice, without any deductions whatever.

13. Received from Lyons, 1 case of silks, containing 75 pieces, averaging 31½ yards to the piece, and invoiced at 88 cents per yard; what is the duty at 10½ per cent.?
Ans. $218.29.

14. A merchant received from England 250 pieces of broadcloth, worth $3.50 per yd.; if each piece measure 53¼ yd., what will be the duty at 30 per cent.?
Ans. $13978.13.

15. A merchant received from Demarara, 167 bags of coffee, 172 lb. per bag, invoiced at 8½ cents per lb.; the tare was 5 per cent.; what was the duty at 16⅔ per cent.?
Ans. $386.58.

16. A grocer received from Canton 200 chests of tea, 63 lb. per chest; the tare was 7 per cent.; what was the duty at 8½ cents per lb.?
Ans. $996.03.

17. If I import 80 tons of iron at $78 per ton, duty 33⅓ per cent., and sundry expenses $2.50 per ton, what will the whole cost me?
Ans. $8520.

18. A merchant imported 45 cases of cotton goods, each containing 60 pieces, each piece 38¾ yards, invoiced at 6 cents per yard; what is the duty at 2½ per cent.?
Ans. $156.94.

19. A liquor dealer received from Bourdeaux, 17 pipes of brandy, marked 114 gallons each, and invoiced at $1.75 per gallon. If the leakage be 2 per cent., the duty equivalent to the value of the brandy, and the other charges 1½ per cent., what will the whole cost him?
Ans. $6697.195+.

20. What is the duty on 54 T. 13 cwt. 3 qr. 20 lb. of iron, invoiced at $45 a ton, and the duty 33⅓ per cent.?
Ans. $820.46.

21. Received from Malaga, 725 boxes of raisins, each box weighing 18 lb, invoiced at 6¾ cents per pound. The tare was 2 lb. per box, and the duty 7 per cent.; for how much must he sell them to gain $250?
Ans. $1087.81.

22. A merchant imported a case of silk plush from Mentz, in France. The case contained 41 pieces, each piece 25⅜ metres, at $2 a metre; the duty was 10 per cent.; how much a yard must he sell the plush to gain 25 per cent.? Ans. $2.54 (nearly.)

23. If I import 750 pieces of silk braid, each piece 50 metres, invoiced at 6 cents per metre, on which there is a duty of 15 per cent., how much will I gain by selling it at 9 cents per yard? Ans. $1068.75.

24. Mesier & Hauptman imported 12 cases German cloth, each case containing 34 pieces, averaging 35 aunes to the piece, and invoiced at $2.50 the aune. The duty was 20 per cent. How much will they gain on a yard by selling at an advance of 33⅓ per cent., and what will be the duty? Ans. { 80 cts. a yd. gain. / $7140 duty.

BARTER.

Art. 265. What is Barter?

Barter is the exchange of one kind of produce or merchandise for another.

Art. 266. How are sums in Barter calculated?

By the rules of analysis.

1. A person exchanged a watch valued at $80, for potatoes at $1.25 per bushel; how many bushels did he get? Ans. 64 bushels.

2. A gave B a house and lot worth $2500, for 400 barrels of flour; what was the value of the flour per barrel? Ans. $6.25.

3. How many yards of muslin at 45 cents per yard can be bought for 900 bushels of wheat, valued at $1.87½ a bushel? Ans. 3750 yards.

4. If a pound of sugar is worth 7½ cents, how many pounds can be got for 2 tons 10 cwt. of iron at $60 a ton? Ans. 2000 lb.

5. If 45 cwt. 2 qr. 12½ lb. of raisins, at $13.44 per cwt., be exchanged for 1022 gallons of alcohol, what will be the price per gallon? Ans. 60 cents.

6. How many acres of land, at $150 per acre, can be exchanged for 750 barrels of flour, at $4.60 per barrel? Ans. 23 acres.

7. A person traded 456 yd. 3 qr. 2 na. of broadcloth, at $2.50 per yard, for molasses at 25 cents per gallon; how many gallons did he get? Ans. 4568¾ gal.

8. A person exchanged two houses and lots, valued at $2500 each, for 15 A. 3 R. 20 p. of land; what was the price per acre? Ans. $314.96.

9. How many pounds of butter at 25 cts. a pound can be exchanged for 7½ yd. of cloth valued at $4.50 a yard? Ans. 135 lb.

10. A country pedlar offered a farmer a piece of muslin which contained 60 yd., for a firkin of butter, valued at 22½ cts. a pound; how much does the pedlar value his muslin a yard? Ans. 21 cts.

11. How many yards of cloth at $4.50, should be given for a watch worth $63.90? Ans. 14⅕ yd.

12. At $42 a thousand, how many feet of lumber should be given for a farm containing 33 A. 2 R. 16 p., valued at $250 an acre? Ans. 200 thousand.

13. A person had 689 lb. tea, worth 88 cts. a pound, which he exchanged for sugar, at 5½ cts. a pound; how many pounds of sugar did he get? Ans. 11024 lb.

14. Three persons entered in a partnership, in which the first put $4000, the second, $7000, and the third, $10000; their profits were 16⅔ per cent., with which they purchased a farm containing 4.375 acres; what was it worth an acre? Ans. $800.

15. A merchant had 22 pieces of cloth, each piece measuring $28\frac{3}{4}$ yards, which he bartered for $9\frac{1}{28}$ tons of sugar, at $10\frac{1}{2}$ cts. a pound; what was the value of the cloth per yard?

Ans. $3.00.

16. 750 barrels of flour were consigned to New York from Oswego; they sold for $\$5\frac{1}{4}$ a barrel, commission $1\frac{7}{8}$ per cent. The balance was laid out in white lead, at $6\frac{3}{4}$ cts. a lb., how many pounds of lead were sent to Oswego? Ans. 55876.734+ lb.

17. A merchant has 160 barrels of pork, valued at $10.50 a barrel, for cash, but he charges in barter an advance of 10 per cent.; he sells $\frac{3}{4}$ of the whole for cash, and exchanges the rest for corn, at 42 cts. a bushel; how many bushels does he get? Ans. 1100 bushels.

18. A bought 13 hhd. of sugar, each weighing 12 cwt. 1 qr. 16 lb. gross, tare $7\frac{1}{2}$ per cent., at 11 cts. per pound net; if he exchange the net at an advance of 5 per cent. for potatoes, at $2.38 a barrel, how many barrels will he get? Ans. 724.2 bar.

19. A merchant sent 15000 bushels of grain to Liverpool, which was sold at $25\frac{1}{2}$ pence sterling, a bushel, when the exchange was 8 per cent. premium; if he should receive 1593 yd. 3 qr. of English cloth in payment, what would be the value of one yard, in Federal money? Ans. $4.80.

20. If 34 T. 16 cwt. 1 qr. 5 lb. of copper, at $320 a ton, be exchanged for $6000 in money and wine, at $2.25 a gallon, how many gallons of wine will there be?

Ans. 2284.8 gal.

21. A person put $1600 at interest for 9 months, at 7 per cent. per annum, and spent the interest for butter, at 25 cts. per pound; how many firkins of 56 lb. each, did he get? Ans. 6 firkins.

22. A bought 96 yd. 3 qr. of oil cloth, at $1 per yard, which he sold at a profit of $33\frac{1}{3}$ per cent., and

invested the proceeds in carpet, at $1.72 a yard; how many yards did he get? Ans. 75 yd.

23. Sold 2 hhd. of wine at $2.10 a gallon, and gained 5 per cent.; spent the profit in muslin at 20 cts. a yard; how many yards were there? Ans. 63 yds.

PARTNERSHIP.

Art. 267. What is Partnership?

It is a rule by which, when two or more persons engage in business, it is found what share of the gain or loss each is to receive or pay.

Art. 268. How many kinds of partnership are there?

Two: simple and compound.

Art. 269. What is simple partnership?

It is when two or more persons transact business, and share the gain or loss without regard to time.

Art. 270. What is the rule for simple partnership?

Rule.—*Find what part of the whole capital, the gain or loss is; multiply the resulting fraction by each man's capital separately, and the products will show the gain or loss of each.*

1. Two men enter into partnership; the first puts in $60, and the second, $80, and they gain $35; to how much was each entitled?

Ans. { $15 for the 1st.
$20 for the 2d.

2. A and B enter into partnership; A puts in $300, and B puts in $200; they make $400; to how much is each entitled?

Ans. { $240 for the 1st.
$160 for the 2d.

3. Three persons entered into a speculation; the first

put in $4000, the second, $5000, and the third, $6000; they lost $2000; what part of the loss must each bear?

Ans. $533.33⅓.
$666.66⅔.
$800.

4. Three persons opened a store, and stocked it with goods to the amount of $13000; the first put in $3500, second, $5450, and the third put in the balance; they gained $5600; to how much was each entitled?

Ans.

5. Three men formed a copartnership; into which the first put $3825.20, the second, $4811.50, and the third, $5006.30; they gained 25 per cent. of their capital; to how much was each entitled?

Ans. $956.30 for the 1st.
$1202.87½ for the 2d.
$1251.57½ for the 3d.

6. A, B, C, and D, ship flour to Liverpool; A furnishes 600 barrels, B, 450 barrels, C, 780 barrels, and D, 1112 barrels; during a storm 650 barrels were thrown overboard; what portion of the loss must each share?

Ans. 132 828/1471 A's share.
99 621/1471 B's "
172 488/1471 C's "
245 1005/1471 D's "

7. Three men hired a pasture ground for cattle for one year, at an expense of $45; the first has 100 head of cattle in pasture, the second, 150, and the third, 50; how much must each pay?

Ans. $15.
$22.50.
$7.50.

8. X, Y, and Z gained in one year $1566.75; X put in $3150, Y, $5000, and Z, $4560; what is the share of each.

Ans. for X.
for Y.
for Z.

9. A and B entered into a speculation and gained $2000; A advanced $3000, and B $2000; what per cent. was gained? Ans. 40 per cent.

10. Smith, Jones, and Brown enter into partnership, and make $1650; Smith put in $5600, Brown, $4900, and Jones, $3500; to how much of the gain was each entitled?

Ans. { $660 for Smith.
$577.50 for Jones.
$412.50 for Brown.

11. A vessel got aground; in order to lighten her, the captain ordered 200 barrels of flour that belonged to X, and 40 barrels that belonged to Y, to be thrown overboard; X lost $\frac{1}{4}$ of his shipment, and Y, $\frac{2}{3}$ of his; how much was the shipment of each?

Ans. { X.
Y.

12. A and B entered into trade; A put in $5000 and B 800 barrels of flour; they gained $1800, of which B took $800 for his share of the gain; how much was B's flour per barrel? Ans. $5 per barrel.

13. Smith and Brown opened a grocery; Smith put in 300 firkins of butter, each firkin 56 lb., at $20\frac{1}{2}$ cents per pound, and $1000 in cash; Brown put in $3000; they gained $2010.12; what was the share of each?

Ans. { $1200.02 Smith.
$810.10 Brown.

14. Brown & White enter into a partnership in the dry good business; Brown puts in 100 pieces of cloth, each piece $28\frac{3}{4}$ yards, at $2.50 per yard; 150 pieces of linen, each piece 12 yards, at 75 cents a yard, and $500 in cash; White puts in 350 pieces of muslin, each piece 32 yards, at $23\frac{3}{4}$ cents per yard, and $2000 cash; they lost $2300; how much of the loss must each sustain?

Ans. { $1517.52 Brown.
$782.48 White.

15. A and B started a cotton factory; A fitted up the

building with machinery, &c., to the value of $8500; B furnished the raw material worth $12650; they gained $5562.50; what was the share of each?

Ans. $2235.52 A.
$3326.98 B.

16. Three persons, A, B, and C, built a sloop, A furnished $1000, B $1200, and C 20 000 feet of lumber; they gained in one year $5400, of which C was entitled to $1000; what were the profits of A and B, and the price per 1000 feet of C's lumber?

Ans. $2000 for A.
$2400 for B.
$25 for 1000 ft. of C's lumber.

17. A, B, and C commence business; A puts in 250 firkins of butter, B puts in $2500, and C $4100; their profits amounted to $2210, of which A took $560; how much was his butter a pound, and to how much were B and C entitled?

Ans. 16 cents a pound for C's butter.
$625 for B.
$1025 for C.

18. Brown, Smith, and Jones built a steamboat for $112 500; of which Brown contributed $43000, Smith $30000, and Jones the remainder; they gained $58160 by carrying freight, and $11840 by carrying passengers; to how much was each entitled?

Ans. $\$26755.55\frac{5}{9}$ Brown.
$\$18666.66\frac{2}{3}$ Smith.
$\$24577.77\frac{7}{9}$ Jones.

19. A, B, and C enter into partnership; A puts in $2000, B $3000 and C 1000 gallons of wine; they gained $900, of which C took $300 for his share of the profits; to what part of the gain was each of the others entitled, and what was the price of C's wine per gallon?

Ans. $240 A.
$360 B.
$2.50 C's wine per gall.

COMPOUND PARTNERSHIP.

Art. 271. What is Compound Partnership?

It is a partnership in which the amount and time of investment are taken into consideration.

Art. 272. What is the rule for calculating the gain or loss for each person, in compound partnership?

Rule.—*Multiply each person's capital by the time it is invested; add the products thus formed, and then find what part of the sum the gain or loss is; multiply the resulting fraction by the product of each man's time and money; the products thus found will be each man's gain or loss.*

1. A and B commenced in trade; A put in $350 for 8 months, and B put in $600 for 7 months; they gained $700; to what part of the gain is each entitled?

Ans. { $280 for A.
$420 for B.

2. X and Y had been engaged in business and gained $8700; X had $3000 in for 3 years, and Y had $4000 in for 5 years; to how much was each entitled?

Ans. { $2700 for X.
$6000 for Y.

3. Wood and Bronson engaged in business; Wood put in $18000 for 17 months, and Bronson put in $24000 for 6 months; while in business they lost $6500; how much of the loss much each bear?

Ans. { $4420 Wood.
$2080 Bronson.

4. A, B, and C engaged 20 acres of pasture land to feed cattle; A had 150 head on the land for 24 days, B had 250 head on for 60 days, and C 300 head for 75 days;

they paid $35 for the use of the pasture ground; how much did each have to pay?

Ans. $\$3.06\frac{78}{137}$ for A.
$\$12.77\frac{51}{137}$ for B.
$\$19.16\frac{8}{137}$ for C.

5. Three persons who had been in business made up their accounts to the 1st of January, when the balance sheet showed a gain of $18049.60; the first had $22000 in the business for the year preceding, the second had $18600 in for 10 months, and the third had $30000 in for 7 months; to what part of the gain was each entitled?

Ans. $7219.84 for the 1st.
$\$5086.70\frac{6}{11}$ for the 2d.
$\$5743.05\frac{5}{11}$ for the 3d.

6. Four persons were engaged in the Express business; the first had $4000 employed for 13 months, the second $3000 for 18 months, the third $3500 for 20 months, and the fourth $1800 for 2 years; they lost $3250; what was the loss of each?

Ans. $\$770.98\frac{74}{137}$.
$\$800.63\frac{119}{137}$.
$\$1037.86\frac{68}{137}$.
$\$640.51\frac{13}{137}$.

7. On the 1st of January, 1852, James Wilson opened a hardware store with a stock of $17200; on the 1st of April, Joseph Brooks entered into partnership with him, and advanced $12000; on the 1st of July, Abraham Miller put in goods to the amount of $16000; on the 1st of January, 1853, when the balance sheet was exhibited, there appeared a net profit of $8060; to how much was each partner entitled?

Ans. $\$4053.56\frac{124}{171}$ for Wilson.
$\$2121.05\frac{45}{171}$ for Brooks.
$\$1885.38\frac{2}{171}$ for Miller.

8. A commenced business with a capital of $10000, on the 1st of January, 1852; on the 1st of May, B entered into partnership with him, and put in 1500 barrels of flour; on the first of January, 1853, their profits were

$5100, of which B was entitled to $2100; what was the value of the flour per barrel? Ans. $7.

9. A had $3300 at interest for 60 days; B had $4100 at interest for 45 days, and C had $4950 at interest for 70 days; they received $162 interest money; what did each get, and what was the rate per cent.?

Ans. $44 for A.
$41 for B.
$77 for C.
8 per cent.

10. On the 1st of January, 1851, A commenced business with a capital of $23000; two months afterward he drew $1800; on the 1st of April, B entered into partnership with him, and put in $13500; on the 1st of August, 1851, he drew $10000; on the 1st of January. 1852, their profits were $8400; to how much was each entitled?

Ans. $6577.24 for A.
$1822.76 for B.

EQUATION OF PAYMENTS.

Art. 273. What is Equation of Payments?

Equation of payments is a rule for finding the time for paying the total amount of several sums of money, which taken separately, are payable at different times.

Art. 274. To find the equated time,

Rule.—*Multiply each sum of money by its time; add the several products thus formed together, and divide their sum by the total amount of money; the quotient will be the equated time.*

Note.—*Equated time* and *average time* are synonymous terms.

1. A merchant owes $300, payable in 2 months, and $900, payable in 4 months; what is the equated time for paying the whole? Ans. 3½ months.

2. There are three payments due as follows; $250 in 2 months, $350 in 4 months, and $500 in 5 months; what is the equated or average time for the payment of the whole? Ans. 4 months.

3. What is the equated time for paying the sum of three notes, of which the first for $100, is due in 5 months, the second for $150, in 4 months, and the third for $150, in 6 months? Ans. 5 months.

4. What is the average time for paying the amount of four notes, of which the first for $2000, is due in 1 month, the second, for $3000, in 2 months, the third, for $4000, in 3 months, and the fourth, for $1000, in 5 months? Ans. 2¼ months.

5. A merchant has $1900 to pay in 4 months, $1900, in 6 months, and $1900 in 8 months; what is the average time for paying the whole amount? Ans. 6 months.

6. A person owes three notes; the first is for $300, payable in 3 months; the second, for $400, payable in 6 months; and the third, for $500, payable in 15 months; what is the equated time of paying the sum of the three notes? Ans. 9 months.

7. A person bought a house for $2400, for which he agreed to pay as follows: $650 in 3 months, $900 in 8 months, and the rest in 9 months; what would be the mean or equated time to pay the whole?
Ans. 7 months.

8. A person promised to pay $900 in three equal instalments, viz.: $300 down, $300 in 30 days, and $300 in 60 days; what is the equated time?
Ans. 30 days.

9. What is the average time to pay 4 notes, each $500, one immediately, another in 20 days, the third in 60 days, and the fourth in 80 days? Ans. 40 days.

10. A sum of $2400 is payable in four equal instalments; the first in 30 days, the second in 60 days, the

third in 90 days, and the fourth in 120 days; what is the average time to pay the whole? Ans. 75 days.

11. A person bought a farm for $3000, for which he agreed to pay at the following stated times; $500 in 2 months, $500 in 4 months, $800 in 6 months, $800 in 9 months, and the remainder in one year; suppose he wished to pay the whole at once, what would be the average time? Ans. 6 mo. 18 days.

12. A grocer bought of a provision merchant, with whom he kept an account, 200 barrels of beef, at $15.50 a barrel; 10 days afterwards, he bought 150 barrels of pork, at $13.20 a barrel; 20 days after that he bought 150 barrels of beef, at $15.80 a barrel; how many days after the first purchase would be the equated time to date a note? Ans. 12 days.

ART. 275. To find the equated time when payments are made by date,

RULE.—*Consider the first date as the time from which all calculations are to be made; the sum paid on that date will of course be multiplied by zero, it being considered as paid immediately; the other payments must be multiplied by the number of days between the first date and the date of each payment; add the several products and divide their sum by the sum of the payments; the quotient will be the number of days after the first date that expresses the time for the payment of the whole, and upon whatever day that falls, will be the average or equated time for giving a note or calculating interest. If the quotient have a fraction which is one half of a day or more, count the fraction as equivalent to one day; if the fraction be less than one half, reject it.*

If credit be given, add the time of credit to the date of each purchase, and calculate as before from the dates thus formed.

13. A person owes three notes; the first is for $200, payable on the 1st of July; the second for $150, payable on the 1st of August, and the third for $250, payable on

the 15th of August; what is the average time for the whole? Ans. 28th of July.

14. There are three notes payable as follows: one for $500, on the 12th of February, 1853, the second for $400, on the 12th of March, and the third for $300, on the 1st of April; what is the average time?
Ans. 5th of March.

15. A merchant has four payments to make; $260 on the 3d February, 1852, $350 on the 10th of March, $300 on the 1st of April, and $400 on the 20th of April; what is the equated time? Ans. 20th of March.

(16.)

NEW YORK, *July* 1, 1853.

JAMES BROWER, *Bought of* G. THOMPSON,

April 1.	25 barrels of Pork at $10,	$250
May 1.	34 " " Beef " $12,	$408
		$658

What is the equated time for giving a note?
Ans. 20th April.

(17.)

A. COOK, *Bought of* JONES & Co.

1853.	Aug. 1,	450 yds.	Muslin at 10c.	$45.00
"	" 16,	800 "	Calico " 12½	100.00
"	Sept. 5,	720 "	Bombazine at 80	576.00
"	Oct. 1,	300 "	Cloth at $3.50	1050.00

What is the equated time for the whole amount?
Ans. 18th of Sept.

(18.)

BENJAMIN SEAVER, *Bought of* APPLEGATE & Co.

1852.	June 13,	1231 yds.	Satinet at 78c.
"	Sept. 1,	1412 "	" " 93¾
"	" 15,	1229½ "	" " 65

What is the average time for payment of the whole?
Ans. On the 12th of August.

(19.)

CHAS. G. MURCH, *Bought of* ANSON TAYLOR.

1852.	July 5, 500 yds. of Silk Plush at	$2.60
“	Oct. 1, 100 Hats at	.68
“	Nov. 20, 78 pieces binding, at	.95
“	Dec. 11, 56 “ “ “	.88

What is the average time to draw a note for 6 months for the whole amount? Ans. 21st of July

(20.)

A purchased of B the following bill of goods, on various times of credit:

May 1st, 1853,	A bill amounting to	$800	3 months.
June 1st,	“ “ “ “	700	3 months.
“ 15th,	“ “ “ “	900	4 months.
July 25th,	“ “ “ “	1000	6 months.

When is equated time for payment of the whole? Ans. Oct. 18th.

(21.)

A person on various times of credit purchased the following bills of goods:

Jan. 1, 1849,	A bill amounting to	$367.20	4 mo.
“ 28,	“ “ “ “	901.80	3 mo.
Feb. 24,	“ “ “ “	826.38	5 mo.
March 30,	“ “ “ “	854.88	6 mo.
May 1,	“ “ “ “	396.50	4 mo.

When is the average time for payment of the whole? Ans. 6th of July.

ART. 276. When the amount of money is to be paid at a stated time and part is paid before due, to find the time for the payment of the remainder,

RULE.—*Multiply the whole sum by the time when due, and from this product subtract the sum of the products of the payments made, by their times; divide the remainder* *by the balance of money to be paid, and the quotient will be the equated time for the payment of the balance. When the payments are made by date, count from the earliest date.*

22. A owes B $400, for which B holds A's note payable in 5 months; A paid $200 in 4 months; what would be the equated time to pay the other $200?
Ans. 6 mo. after date of note.

23. If a person promises to pay $1000 in 7 months, and pays $700 in 4 months, what would be the average time to pay the balance? Ans. 14 months.

24. A person owes $800, to be paid in 6 months; he pays 500 in 4 months; how long would he be entitled to keep the balance? Ans. 9 mo. 10 days.

25. A merchant owes $2000, which he is to pay in one year; he paid $1500 in 8 months; how long may he keep the remainder? Ans. 2 years.

26. A person owes $500 to be paid on the 1st of August, 1853; he paid $200 on the 1st of July; how long is he entitled to keep the remainder, $300?
Ans. 52 days from 1st of July,
Or, on the 22d of August.

27. A merchant owes $700, which is to be paid on the 15th of July; he paid one-half of it on the 1st of July; when should he pay the remainder?
Ans. On the 29th July.

28. A sum of $1000 is to be paid on the 1st of January, 1854; $400 was paid on the 1st of September, 1853; $450 was paid on the 1st of December, 1853; when should the remainder be paid?
Ans. February 20th, 1855.

29. A man bought a house worth $1500, which was to be paid on the 1st of September, 1854; he paid $400 on the 1st of November, 1853; $400 on the 1st of Feb-

ruary, 1854: $400 on the 1st of June, 1854; when should the remaining $300 be paid?

Ans. 21st November, 1856.

30. A person borrowed $1800, which he promised to pay on the 1st of December, 1854; he paid $300 on the 1st of July, 1853; $600 on the 1st of October, 1853; $400 on the 1st of January, 1854; $200 on the 1st of August, 1854; when should he pay the remainder?

Ans. 11th of February, 1860.

31. On the 15th of July, 1853, I borrow $700, to be paid on the 1st of January, 1854, with interest at the rate of 7 per cent. per annum; suppose the rate per cent. to be changed to 6 per cent., at what date should I pay the money so as to yield the same amount?

Ans. 29th January, 1854.

Art. 277. When purchases and partial payments are made at various times, to find the equated time for the balance,

Rule.—*Average the purchases and payments separately; if the average date of the payments be earlier than that of the purchases, proceed as in the previous rule; if it be later, multiply the amount of payments made by the difference between the two average dates and divide the product by the balance to be paid; the quotient will be the number of days previous to the average date of the purchases, that interest must be calculated on the balance.*

(32.)

New York, July 1st, 1849.

Andrew Thompson,

Bought of Edgar Owen.

Feb. 1, 1849,	1 Ton of iron, ...		$ 76.50
May 1, "	2 " " "	at $75 .	150.00
			$226.50
March 15, 1849,	by cash, ...		$200

What remains due 1st of July, 1849?

Ans. The balance will fall due 147 days after the 15th of March, or upon the 6th of August, which will be 39 days after the 1st of July; consequently the discount for 39 days is to be thrown off the balance, $26.50; interest 7 per cent. per annum, which gives $26.31 due to date.

NOTE.—In these sums the difference in time is calculated by days, and if the balance falls due before date, interest must be added to it, if after date, discount must be subtracted.

(33.)

New York, Jan. 1st, 1853.

CLARK & SMITH,

Dr. *Bought of* SAMUEL LEVY.

May 1st,	1852,	To 1000 bu. corn at 40 cts.	$ 400
June 15th,	"	" 2000 " wheat " 90 cts.	1800
Oct. 15th,	"	" 3000 " corn " 40 cts.	1200
			$3400

Cr.

June 1st,	1852,	By cash, ...	$ 300
July 1st,	"	" "	1500
Nov. 1st,	"	" "	1000
			$2800

What is the date from which to reckon interest on the balance? Ans. 26th June, 1853.

(34.)

New York, Jan. 1st, 1854.

E. JONES, *Bought of* C. CLARK,

Jan. 1st,	1853,	200 yd. of cloth at $5, .	$1000.00
Sept. 1st,	"	300 yd. of silk " $1, .	300.00
			$1300.00

March 1st,	1853, by cash, ...	$500
August 1st,	" " "	500
		$1000

From what date must interest be reckoned on the balance, $300; in order to equate the purchases and payments? Ans. 6th June, 1852.

(35.)

New York, May 12th, 1854.

EDGAR KETCHAM,

Bought of EVERETT & Co.

Jan.	3d,	1854,	500 yd.	muslin	at	40	cts.
"	7th,	"	200 "	silk	"	90	"
Feb.	13th,	"	400 "	linen	"	75	"
"	23d,	"	100 "	cloth,	"	$3.50	"

Jan.	20th,	by cash, ...	$300
Feb.	20th,	" "	600

From what date must interest be reckoned on the balance? Ans.

36. A has the following account against B:

Oct.	1st,	1851,	To merchandise,	.	$ 453.20
"	25th,	"	" "	.	729.80
Nov.	12th,	"	" "	.	431.60
Dec.	1st,	"	" "		1054.30

Cr.

Oct.	20th,	1851,	By merchandise,	.	$ 586.50
Nov.	19th,	"	" cash	.	500.00
Dec.	10th,	"	" merchandise	.	1091.81

What is the balance on the 1st of May 1852, supposing that 3 mo. credit is given? Ans. $503.38.

NOTE.—In the above sum, the amount of each purchase and payment is found separately, from the date of purchase or payment to the date of settlement. The difference between the amounts of payments and purchases will be the balance due, and this is the only true way to find the interest balance.

ALLIGATION.

Art. 278. What is Alligation?

Alligation is the finding of the value of a compound that is composed of ingredients of different values, or it is the composition of ingredients in such quantities that the compound may have a given value.

Art. 279. What are the two kinds of alligation?

Alligation medial and alligation alternate.

Art. 280. What is alligation medial?

It is the finding of the value of a compound that is composed of ingredients of different values.

Art. 281. What is the rule for alligation medial?

Rule.—*Add together the values of the articles mixed, and divide the sum by the number of articles in the mixture; the quotient will be the value of a single article of the compound.*

1. If one pound of coffee at 16 cents, and one pound at 18 cents be mixed together, what will the mixture be worth a pound? Ans. 17 cents.

2. If sugar at 7, 8, and 9 cents a pound be mixed, what will be the value of one pound of the mixture? Ans. 8 cents.

3. If coffee at 16, 17, 19, and 20 cents a pound be mixed, what will be the value of one pound of the mixture? Ans. 18 cents.

4. If tea at 50, 70, 80, and 100 cents a pound be mixed, what will be the value of one pound of the mixture? Ans. 75 cents.

5. A wine dealer mixed several kinds of wine at $1.50,

$1.75, and $2 a gallon; what is the average price per gallon of the mixture? Ans. $1.75.

6. If a gallon of alcohol at 50 cts., and a gallon at 85 cts. be diluted by a gallon of water, what will be the price of one gallon of the mixture? Ans. 45 cents.

7. During the seven days of a week the thermometer stood as follows: 62°, 63°, 61°, $64\frac{1}{2}$, $63\frac{1}{2}$, 68°, and 64°; what is the average height for the week? Ans. $63\frac{5}{7}$°.

8. If gold of 21, 20, 18, and 17 carats fine be melted together, how pure will be the compound?

Ans. 19 carats fine.

NOTE.—The purity, and consequently the value of gold, is reckoned by carats; pure gold is said to be 24 carats fine, and is so soft that it easily wears away; by mixing some other metal with it, it becomes harder; the metal with which it is mixed is called alloy, and in reference to gold, like water to liquids, is considered of no value; gold of 23 carats fine, expresses 23 parts of pure gold and one of alloy; 22 carats fine expresses 22 parts of pure gold and two parts alloy, &c., the parts of gold and alloy always making 24.

9. A goldsmith melted together 3 oz. of gold 20 carats fine, 5 oz. 18 carats fine, and 5 oz. 22 carats fine; what is the purity of the mixture? Ans. 20 carats fine.

10. A grocer mixed together 60 lb. of sugar, at 10 cts. a pound, 75 lb. at 12 cts. a pound, and 75 lb. at $16\frac{2}{5}$ cts. a pound; what was the value of one pound of the mixture? Ans. 13 cts.

11. A grocer mixed together 35 lb. of coffee at 16 cts. a pound, 36 lb. at 13 cts. a pound, and 25 lb. at 28 cts. a pound; what was the value of one pound of the mixture? Ans. 18 cts.

12. A grocer mixed together 12 lb. of tea at 60 cts. a pound, 15 lb. at 72 cts. a pound, and 18 lb. at 90 cts. a pound; what was the value of one pound of the mixture?

Ans. 76 cts.

13. A liquor dealer mixed together 25 gallons of brandy at $1.60 a gallon, 25 gallons at $1.80 a gallon, and 18 gallons of water; what was the value of one gallon of the mixture, and how much did he make on a

gallon, provided the mixture was sold at the average price of the liquor?

Ans. { $1.25 a gallon the mixture.
45 cts. a gallon gained.

14. A farmer mixed together 54 bushels of rye at 65½ cents a bushel, 81 bushels at 68¾ cents a bushel, and 45 bushels at 81¼ cents a bushel; what was the value of one bushel of the mixture? Ans. $.709.

15. A person bought 32 gallons of wine for 90 cents a gallon, 48 gallons at 95 cents a gallon, and 64 gallons at $1.08 a gallon; for how much a gallon must he sell the mixture to gain 20 per cent.? Ans. $1.196.

16. A grocer sold 34 lb. of sugar at 5 cents a pound, 102 lb. at 8 cents a pound, 136 lb. at 10 cents a pound, and 34 lb. at 12 cents a pound, and thereby gained 50 per cent.? what was the average cost of one pound?

Ans. 6 cents.

ALLIGATION ALTERNATE.

Art. 282. What is Alligation Alternate?

It is the composition of ingredients in such quantities that the compound may have a given value.

Art. 283. What is the rule for Alligation Alternate?

Rule 1st.—*If there be two ingredients mixed, of which the value of one is as much below the mean value as that of the other is above, the number of ingredients will be equal.*

2d. *If there are two ingredients mixed, whose values are unequally above and below the mean value, there will be as many of the greater value as the mean exceeds the less, and as many of the less value as the greater exceeds the mean.*

3d. *If there be three or more ingredients mixed, compare any two whose values are, the one greater and the other less* *than the mean; the result will be the number of ingredients for those two; then compare other two, until the value of each has been used, when the various quantities of each value will be found.*

NOTE.—When two or more of less value than the mean, are compared with one greater, there will be as many of the greater value, as the mean exceeds each of the less; proceed in like manner when several of a greater value are compared with one of less.

There will be a variety of answers, since any two, (the one greater, the other less,) may be compared; and likewise when equal parts or multiples of the answers by the previous rules are mixed, they give the same mean value of the mixture. The form generally used is the following, where each difference is placed opposite to the value to which it belongs.

$$10\begin{cases}7 & 2 \text{ at } 7.\\ 9 & 2 \text{ at } 9.\\ 12 & 3+1=4 \text{ at } 12.\end{cases}\qquad 18\begin{cases}15 & 6+3+1=10.\\ 19 & 3\\ 21 & 3\\ 24 & 3\end{cases}\quad \text{\&c.}$$

17. A grocer wishes to mix sugar at 8 and 10 cents a pound, so that the mixture may be worth 9 cents a pound; in what quantities shall he mix it?

Ans. Equal quantities, as 1 lb. of each, 5 lb. of each, &c.

18. A grocer wishes to mix tea at 95 cents a pound with tea at 63 cents a pound, so that the mixture may be worth 79 cents a pound; how shall he mix it?

Ans. Equal quantities of each.

19. A grocer mixed coffee worth 19 cents a pound with coffee worth 13 cents a pound, in such quantities as to have a mixture worth 15 cents a pound; in what proportion did he mix the different qualities?

$$\text{Ans.}\begin{cases}\text{4 lb. at 13 cents.}\\ \text{2 lb. at 19 cents.}\end{cases}$$

NOTE.—If these quantities be divided or multiplied by the same number the results when mixed will give the same average value.

20. How can wine worth 85 cents a gallon be mixed with wine worth $1.20 cents a gallon, so as to form a mixture worth $1 a gallon?

$$\text{Ans.}\begin{cases}\text{20 gallons at 85 cents.}\\ \text{15 \quad " \quad at \$1.20 cts.}\end{cases}\text{or in proportion.}$$

21. In what proportion can alcohol worth 65 cents a

gallon be diluted with water, so as to form a mixture worth 60 cents a gallon?

Ans. { 60 gallons of alcohol.
5 " of water.

22. In what proportion should gold of 18, 20 and 23 carats fine be melted together so as to form a compound of 19 carats fine?

Ans. 5 of 18, 1 of 20, and 1 of 23.

23. In what proportion should gold of 17, 18 and 22 carats fine be melted together to form a compound of 20 carats fine?

Ans. 2 of 17, 2 of eighteen, and 5 of 22.

24. In what quantities should sugar at 8, 10, 12 and 15 cents a pound be mixed together to form a mixture worth 11 cents a pound?

Ans. 1 lb. at 8 cts., 4 lb. at 10 cts., 3 lb. at 12 cts., and 1 lb. at 15 cents.
Or—4 lb. at 8 cts., 1 lb. at 10 cts., 1 lb. at 12 cts. and 3 lb. at 15 cents.

25. How can wine worth \$1.75, \$1.87½, be mixed together and diluted with water, to form a mixture worth \$1.62½ a gallon?

Ans. { 162½ gallons at \$1.75.
162½ " at 1.87½.
37½ " of water.

26. In what proportions can gold of 16, 18 and 21 carats fine be further alloyed so as to form a mixture of 19 carats fine?

Ans. { 2 of 16 carats fine.
2 " 18 " "
4 " 21 " "
No alloy.

or { 2 parts of alloy.
2 " " 16 ca. fine.
2 " " 18 " "
23 " " 21 " "

27. In what proportion can tea at 56¼, 60, 68, and 75 cents a pound be mixed so as to form a compound worth 65 cents a pound?

Ans. { 10 at 56¼ cents.
3 " 60 "
5 " 68 "
8¾ " 75 " &c.

28. How many pounds of tea at 60 cents a pound must be mixed with 25 lb. of tea at 75 cents a pound, so as to form a mixture worth 70 cents a pound?

Ans. 12½ lb. at 60 cents.

29. How many pounds of sugar at 9 cents a pound must be mixed with 50 lb. at 8 cents a pound, so as to form a mixture worth 8½ cents a pound?

Ans. 50 lb.

30. How many pounds of sugar at 7 and 11 cents a pound must be mixed with 75 lb. at 12 cents a pound, so as to form a mixture worth 10 cents a pound?

Ans. 75 lb. of each.

31. How many ounces of gold of 15, 18 and 20 carats fine must be mixed with 7 ounces of 19 carats fine, so that the compound may be 17 carats fine?

Ans. 21 oz. of 15 carats, 7 of 18 and 7 of 20.

32. How many gallons of oil at 7*s.*, 7*s.* 6*d.*, and 9*s.* a gallon must be mixed with 24 gallons of oil at 9*s.* 6*d.* a gallon, so as to form a mixture worth 8*s.* a gallon?

Ans. 36 gall. at 7*s.*, 24 at 7*s.* 6*d.*, and 12 at 9*s.*
Or, 48 gall. at 7*s.*, 72 at 7*s.* 6*d.*, and 48 at 9*s.*, &c.

33. A liquor dealer has a barrel containing 32 gallons which he wishes to fill with water and brandy at $2.24 a gallon, so that the mixture may be worth $2.10 a gallon; in what proportion are they to be mixed?

Ans. { 30 gallons of brandy.
2 " of water.

34. How can a hogshead containing 63 gallons be filled with wine at $1.20 and $1.08 a gallon, so that the mixture may be worth $1.17 a gallon?

Ans. 47¼ gall. at $1.20 and 15¾ at $1.08.

INVOLUTION.

Art. 284. What is Involution?

Involution is the multiplication of any number by itself a certain number of times.

Art. 285. If a number be multiplied by itself, what is the product called?

The square of that number.

Art. 286. If a number be involved three times, that is, once as a multiplicand and twice as a multiplier, what will the product be called?

The cube, or third power of that number.

Art. 287. If a number be involved four, five, or six times, what will the product be called?

The fourth, fifth, or sixth power of that number.

1. What is the square of 9? Ans. 81.
2. What is the square of 14? Ans. 196.
3. What is the square of 23? Ans. 529.
4. What is the square of 54? Ans. 2916.
5. What is the square of 841? Ans. 707281.
6. What is the square of 3759? Ans. 14130081.
7. What is the square of 75.4? Ans. 5685.16.
8. What is the square of 9.145? Ans. 83.631025.
9. What is the square of 316.05? Ans. 99887.6025.
10. What is the square of .75. Ans. .5625.
11. What is the square of .125? Ans. .015625.
12. What is the square of .04375? Ans. .0019140625.

13. What is the square of $\frac{3}{5}$? Ans. $\frac{9}{25}$.
14. What is the square of $\frac{7}{8}$? Ans. $\frac{49}{64}$.
15. What is the square of $\frac{9}{11}$? Ans. $\frac{81}{121}$.
16. What is the square of $\frac{15}{31}$? Ans. $\frac{225}{961}$.
17. What is the square of $\frac{56}{75}$ Ans. $\frac{3136}{5625}$.
18. What is the square of $8\frac{3}{4}$? Ans. $76\frac{9}{16}$.
19. What is the square of $12\frac{9}{13}$? Ans. $161\frac{16}{169}$.
20. What is the square of $119\frac{4}{5}$? Ans. $14352\frac{1}{25}$.
21. What is the cube of 7? Ans. 343.
22. What is the cube of 9? Ans. 729.
23. What is the cube of 17? Ans. 4913.
24. What is the cube of 25? Ans. 15625.
25. What is the cube of 79? Ans. 493039.
26. What is the cube of 175? Ans. 5359375.
27. What is the 4th power of 8? Ans. 4096.
28. What is the 5th power of 16? Ans. 1048576.
29. What is the cube of 3.5? Ans. 42.875.
30. What is the cube of .27? Ans. .019683.
31. What is the 4th power of 2.05? Ans. 17.66100625.
32. What is the cube of $\frac{6}{13}$? Ans. $\frac{216}{2197}$.
33. What is the cube of $7\frac{1}{2}$? Ans. $421\frac{7}{8}$.
34. What is the cube of $13\frac{3}{4}$? Ans. $2599\frac{39}{64}$.
35. What is the 4th power of $5\frac{3}{8}$? Ans. $834\frac{2737}{4096}$.
36. What is the 5th power of $3\frac{3}{4}$? Ans. $741\frac{591}{1024}$.

EVOLUTION.

Art. 288. What is Evolution?

Evolution is the process of separating a number into equal factors.

Art. 289. What is a square root?

Square root is the separating of a number into equal two factors.

Art. 290. To extract the square root of a number,

Rule.—I. *Commence at the units, place and separate the given number into periods of two figures each;*

II. *Find the greatest square number in the left-hand period, and place its root to the right of the given number, as in long division, and call it the first figure of the root; square this figure and subtract the square from the left period, and to the remainder annex the next period consisting of two figures, to form the next dividend;*

III. *Double the root already found for a trial divisor, and find how many times it is contained in all the figures of the dividend, except the last; place the quotient to the right of the first figure of the root, and also to the right of the trial divisor to form the complete divisor;*

IV. *Multiply the divisor thus formed by the second figure of the root; subtract the product from the dividend, annex the next period to the remainder, and proceed from the section 3d for other figures of the root.*

Note.—No figure of the root can exceed 9. The remainder is sometimes equal to, and often greater than, the *divisor for the time being.*

Art. 291. To extract the square root of a decimal fraction,

Find the square root of the first two decimals to the right of the point, and then proceed as in whole numbers.

Art. 292. To extract a square root of a vulgar fraction,

Find the square root of the numerator, and then the *square root of the denominator, or reduce it to a decimal fraction, and extract the root.*

1. What is the square root of 16? Ans. 4.
2. What is the square root of 81? Ans. 9.
3. What is the square root of $\frac{9}{25}$? Ans. $\frac{3}{5}$.
4. What is the square root of $\frac{64}{100}$? Ans. $\frac{8}{10}$.
5. What is the square root of .09? Ans. .3.
6. What is the square root of .49? Ans. .7.
7. What is the square root of 1600? Ans. 40.
8. What is the square root of 1764? Ans. 42.
9. What is the square root of 2809? Ans. 53.
10. What is the square root of 6241? Ans. 79.
11. What is the square root of 27889? Ans. 167.
12. What is the square root of 251001? Ans. 501.
13. What is the square root of 6275025? Ans. 2505.
14. What is the square root of 38950081? Ans. 6241.
15. What is the square root of 5647.5225? Ans. 75.15.
16. What is the square root of 656748.16? Ans. 810.4.
17. What is the square root of 3687.525625? Ans. 60.725.
18. What is the square root of 160048.0036? Ans. 400.06
19. What is the square root of .205209? Ans. .453.
20. What is the square root of .022201? Ans. .149.

21. What is the square root of 135? Ans. 11.614.

22. What is the square root of 7994?
Ans. 89.409.

23. What is the square root of 19000?
Ans. 137.844.

24. What is the square root of .9? Ans. .9486.

25. What is the square root of .5? Ans. .7071.

26. What is the square root of .1? Ans. .3114.

27. What is the square root of .784? Ans. .8854.

28. What is the square root of 1.5? Ans. 1.2247.

29. What is the square root of 196.425?
Ans. 14.0151.

30. What is the square root of .00794?
Ans. .0891.

31. What is the square root of .000625.
Ans. .025.

32. What is the square root of 86432.9864?
Ans. 293.99.

Art. 293. What is a mean proportional between two numbers?

It is the square root of their product.

33. What is the mean proportional between 9 and 16?
Ans. 12.

34. What is the mean proportional between 18 and 32? Ans. 24.

35. What is the mean proportional between 500 and 600? Ans. 547.722.

36. What is the mean proportional between 18¾ and 22½? Ans. 20.539.

37. What is the mean proportional between 75.48 and 80.061? Ans. 77.736.

28. What is the mean proportional between .01875 and .006 ? Ans. .0106.

Art. 294. To extract the cube root of a number,

Rule.—1st. *Separate the given number into periods of three figures each, commencing at the units place;*

2d. *Find the greatest cube in the left hand period, and place its cube root to the right of the given number as in long division, and call it the first figure of the root.*

Subtract the cube of this number from the left hand period, and to the remainder annex the next period, which number thus formed consider as a new dividend.

3d. *For a partial divisor, square the root already found, multiply the square by* 300 *and divide the product into the dividend to find the next figure of the root.*

4th. *Multiply the figure last placed in the root by that previously there, and multiply* their product *by* 30.

Square the figure last placed in the root, and add the square to the products formed by multiplying by 300 *and by* 30; *the sum thus formed will be the complete divisor.*

5th. *Multiply the complete divisor by the figure last placed in the root, subtract the product from the dividend, and to the remainder annex the next period for a new dividend; for another figure in the root commence at section* 3, *and proceed as before.*

Art. 295. To extract the cube root of a decimal fraction,

Extract the cube root of the first three figures for the first figure of the root, bring down the other decimals in periods of three figures each, (annexing ciphers if necessary,) and proceed according to the rule.

Art. 296. To extract the cube root of a vulgar fraction, *Extract the cube root of the numerator and denominator separately; or reduce to a decimal fraction and extract the cube root.*

Note.—When the root has been extracted to four or five figures, there will be but a small error in continuing to divide by the last divisor, for other figures of the root.

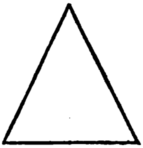
39. What is the cube root of 216? Ans. 6.
40. What is the cube root of 343? Ans. 7.
41. What is the cube root of 729? Ans. 9.
42. What is the cube root of $\frac{27}{64}$? Ans. $\frac{3}{4}$.
43. What is the cube root of $\frac{512}{1000}$? Ans. $\frac{8}{10}$.
44. What is the cube root of 1728? Ans. 12.
45. What is the cube root of 8000? Ans. 20.
46. What is the cube root of 125000? Ans. 50.
47. What is the cube root of 4096? Ans. 16.
48. What is the cube root of 9261? Ans. 21.
49. What is the cube root of 46656? Ans. 36.
50. What is the cube root of 1815848? Ans. 122.
51. What is the cube root of 16777216? Ans. 256.
52. What is the cube root of 28652616? Ans. 306.
53. What is the cube root of 651714363? Ans. 867.
54. What is the cube root of 32891033.664? Ans. 320.4.
55. Extract the cube root of .064. Ans. 4.
56. Extract the cube root of .000729. Ans. .09.
57. Find the cube root of .000003375. Ans. .015.
58. What is the cube root of .0125? Ans. .232.
59. What is the cube root of .0066592? Ans. .1884.

MENSURATION.

Art. 297. What is Mensuration ?

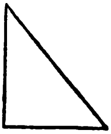
Mensuration is the method of estimating, from certain given parts, the length of lines and the contents of surfaces and solids.

Art. 298. What is a triangle ?



It is a plane figure bounded by three straight lines.

Art. 299. What is a *right-angled* triangle ?



It is triangle that contains a right angle.

Art. 300. What is the longest side of a right-angled triangle called ?

It is called the hypothneuse.

Art. 301. To find the hypothenuse of a right-angled triangle, when the other two sides are known,

Rule.—*Add the squares of the other two sides ; the square root of the sum will be the hypothenuse.*

Art. 230. To find a side of a right-angled triangle, when the hypothenuse and the other side are known,

Rule.—*From the square of the hypothenuse, subtract* *the square of the given side; the square root of the remainder will be the length of the side required.*

1. The two sides of a right-angled triangle are 40 and 30 feet; what is the length of the hypothenuse?
Ans. 50 feet.

2. The two sides of a right-angled triangle are 7 yards and 24 yards; what is the length of the hypothenuse?
Ans. 25 yards.

2. The two sides of a right-angled triangle are 30⅛ feet and 104 feet; what is the length of the hypothenuse?
Ans. 108⅛ feet.

4. The two sides of a right-angled triangle are 13½ and 16⅞ feet; what is the length of the hypothenuse?
Ans. 21.61+ feet.

5. The two sides of a right-angled triangle are 14.34 rods and 29.05 rods; what is the length of the hypothenuse? Ans. 32.3 rods.

6. The hypothenuse of a right-angled triangle is 411 feet and the base is 205 feet; what is the length of the other side or perpendicular? Ans. 356.224 feet.

7. The hypothenuse of a right-angled triangle is 64 rods and the perpendicular is 34.75 rods; what is the length of the other side or base? Ans. 53.744 rods.

8. The hypothenuse of right-angled triangle is 43¾ yards and one side is 18¾ yards; what is the length of the other side? Ans. 39.528 yards.

9. A ladder is placed with one end on the side walk 10 feet from a house, and just reaches the gutter which is 30 feet high; how long is the ladder?
Ans. 31.62 feet.

10. A person is standing 350 feet from the bottom of a tower which is 262½ feet high; how many feet is it from him to the top of the tower? Ans. 437½ feet.

11. A room is 45 feet square; how far is it from one corner to the opposite? Ans. 63.64 feet.

12. The height of the foremast of a vessel is 90 feet, and the distance from the foot of the mast to the extremity of the bowsprit is 45 feet; about how long is the rope that reaches from the top of the mast to the end of the bowsprit? Ans. 100.62 feet.

13. The two masts of a schooner were placed perpendicular to the deck and 25 feet apart; one mast was 90 feet high and the other 100 feet high; how long was the rope that reached from the top of one mast to the top of the other? Ans. 27 feet (nearly.)

14. A ladder 50 long placed in the street just reaches to the tops of two houses on opposite sides; one of the houses is 35 feet high and the other 30 feet; what is the width of the street? Ans. 75.7 feet.

15. If the two sides of any triangle are 75 feet and 90 feet, and the perpendicular to the third side 45 feet, what is the length of the third side?

Ans. 137.94 feet.

Art. 303. To find the area of a triangle,

Rule.—*Multiply the base by half of the altitude; the product will be the area of the triangle.*

Note.—The surface of similar figures are proportional to the squares of their corresponding sides.

16. What is the area of a triangle whose base is 13 feet, and whose altitude is 22 feet?

Ans. $15\frac{8}{9}$ square yards.

17. What is the area of a triangle whose base is 500 yards, and whose altitude is 270 yards?

Ans. 67500 sq. yd.

18. What is the area of a triangle whose base is 75 chains, and whose altitude 30 chains?

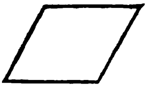
Ans. 112 A. 2 R.

19. What is the area of a triangle whose base is 829.05 yards, and altitude 316 yards?

Ans. 130939.9 sq. yd.

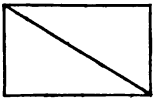
20. What is the area of a triangle whose base 17.35 feet, and whose altitude 11.25 feet?

Ans. 97.59375 sq. ft.



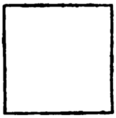
Art. 304. What is parallelogram?

It is a figure of four sides having the opposite sides equal and parallel.



Art. 305. What is a rectangle?

It is a parallelogram that has all its angles right.



Art. 306. What is a square?

It is a parallelogram that has its angles right and all of its sides equal.

Art. 307. To find the area of a parallelogram,

Multiply the base by the altitude, and the product will be the area.

21. What is the area of a rectangle whose base is 24 yards, and altitude 15 yards? Ans. 360 sq. yd.

22. What is the area of a rectangle whose base is 425 feet, and altitude 300 feet?

Ans. 2 A. 3 R. 28 sq. p. 9 sq. yd. 6 sq. ft.

23. What is the area of a parallelogram whose base is $11\frac{1}{2}$ miles, and whose altitude is $4\frac{3}{4}$ miles?

Ans. $54\frac{5}{8}$ sq. m.

24. What is the area of a parallelogram whose base is 95 feet, and whose altitude is $33.33\frac{1}{3}$ feet?

Ans. $3166\frac{2}{3}$ sq. ft.

25. What is the area of a parallelogram whose base is $84\frac{3}{4}$ chains, and the altitude $17\frac{4}{5}$ chains?
Ans. 150 A. 3 R. 16 sq. p.

26. What is the area of a rectangle whose base is 40.775 inches, and altitude $14.03\frac{1}{2}$ inches?
Ans.

27. What is the area of a square whose side is $41\frac{1}{2}$ yards? Ans. 1980.25.

28. What is the area of a square whose side is 77.08 inches? Ans. 5941.3264.

29. If the area of a rectangle is 553.25 square feet, and one of the sides $29\frac{3}{4}$ feet, what is the length of the other side? Ans. 18.59 sq. ft.

30. There is a rectangular piece of land containing 14 A. 3 R. 20 sq. p.; it is 450 feet wide; what is the length of it? Ans. 1439.9 ft.

31. A room 25 feet by 40, is to be covered by carpet, $\frac{3}{4}$ of a yard wide; how many yards will it take?
Ans. $148\frac{4}{27}$ yd.

32. The front of a house $22\frac{1}{2}$ feet wide and 32 feet high, is to be painted at the rate of 25 cents per square yard; it contains 5 windows, each 5 feet by 3, and one door 6 feet by 4; what will be the cost of painting the house? Ans. $17.25.

33. How many marble slabs, 15 in. square, will it take to pave a floor 32 feet long and 25 feet wide? What will be the cost at $3 a square yard for the marble, and 40 cents a square yard for labor?

Ans. { 512 slabs.
{ $193.42.

34. What is the length of the side of a square whose surface is equal to that of a rectangle having its sides 12 and 48 feet long? Ans. 24 feet.

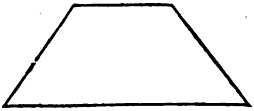
35. If a rectangle have one side 18 yards long and the other 40 yards long, what will be the side of the square that contains the same number of square yards?
Ans. 26.833 yd.

36. How many times larger is a square whose side is 16 feet, than one whose side is 4 feet? Ans. 16 times.

37. How many times larger is a square whose side is 20 feet, than one whose side is 12 feet?
Ans. $2\frac{7}{9}$ times.

38. If one square whose side is $7\frac{1}{2}$ feet be placed inside of another whose side is 20 feet, how many square feet will there be between the two squares?
Ans. 345.75 sq. ft.

Art. 308. What is a trapezoid?



It is a four sided figure, two of whose sides only are parallel.

Art. 309. To find the area of a trapezoid,

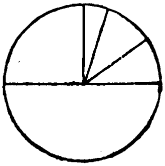
Rule.—*Multiply the sum of the lengths of the parallel sides by half the perpendicular distance between the same sides.*

39. What is the area of a trapezoid whose parallel sides are 25 and 40 feet, and the distance between them or altitude is $17\frac{3}{4}$ feet? Ans. $576\frac{7}{8}$ sq. ft.

40. What is the area of a trapezoid whose parallel sides are $16\frac{3}{7}$ and $14\frac{5}{14}$ feet, and the altitude $4\frac{20}{23}$ feet?
Ans. $74\frac{22}{23}$ sq. ft.

41. What is the area of a trapezoid whose parallel sides are 17.45 and 36.075 ft., and the altitude 200 feet? Ans. 5352.5 sq. ft.

Art. 310. What is a circle?



It is a plane figure enclosed by a curve line, of which every point is equally distant from a point within it, called the centre.

22*

Art. 311. What is the circumference?

It is the curve line that bounds the circle.

Art. 312. What is the diameter of a circle?

It is the straight line that passes through the centre and is terminated each way by the circumference.

Art. 313. What is the radius of a circle?

It is the straight line that passes from the centre to the circumference.

Art. 314. To find the circumference of a circle when the diameter is known,

Rule.—*Multiply the diameter by* 3.1416, *and the product will be the circumference.*

Art. 315. To find the diameter when the circumference is known,

Rule.—*Divide the circumference by* 3.1416 *and the quotient will be the diameter.*

Note.—It is generally said that the circumference of a circle is *little more than* 3 *times* the diameter; $3\frac{1}{7}$ is near enough for ordinary purposes; 3.1416 is nearer still, and is sufficiently exact except in cases where extreme accuracy is required.

42. What is the circumference of a circle whose diameter is 300 feet? Ans. 942.48.

43. What is the circumference of a circle whose diameter is $93\frac{3}{4}$ yards? Ans. 293.525 yards.

44. What is the circumference of a circle whose diameter is 18.625 chains? Ans. 234.0492 rods.

45. What is the diameter of a circle whose circumference is 450 rods? Ans. 143.24 rods.

46. What is the diameter of a circle whose circumference is $375\frac{4}{5}$ feet? Ans. 119.62 feet.

47. What is the diameter of a circle whose circumference is 645.375 chains? Ans. 205.43 chains.

48. What is the circumference of a circle whose diameter is 1649 feet? Ans. 5180.4984 feet.

49. If the distance of the earth from the sun is 95000000 miles, what is the circumference of its orbit? Ans. 596904000 miles.

50. The diameter of the earth is 7912 miles; what is the distance round it? Ans. 24856.3392 miles.

51. How many times will a thread that is 100 yards long, go round a circle 19 inches in diameter? Ans. 60.311 times.

52. The wheel of a carriage is 4½ feet in diameter; how many times will it turn in going a mile? Ans. 373.48 times.

ART. 316. To find the area of a circle when the diameter is known,

RULE.—*Multiply the square of the radius by* 3.1416, *and the product will be the area.* Or,

Find the circumference and multiply it by one half the radius; the product will be the area.

ART. 317. To find the area of a circle when the circumference is known,

RULE.—*Find the diameter and multiply the circumference by one half the radius.*

ART. 318. To find the diameter of a circle when the area is known,

RULE.—*Divide the area by* 3.1416; *the square root of the quotient will be the radius.*

53. What is area of a circle whose diameter is 12 feet? Ans. 113.0976 sq. feet.

54. What is the area of a circle whose diameter is 720 yards? Ans. 407151.36 sq. yards.

55. What is the area of a circle whose radius is $27\frac{1}{2}$ rods? Ans. 2375.835 sq. rods.

56. What is the area of a circle whose radius is 55.75 chains? Ans. 156228.6264 sq. rods.

57. What is the area of a circle whose circumference is 450 feet? Ans. 16114.4 sq. feet.

58. What is the area of a circle whose circumference is $178\frac{4}{5}$ yards? Ans. 2544.014 sq. yds.

59. What is the area of a circle whose circumference is 1498.476 chains? Ans.

60. A person had a piece of land in the form of a circle that measured 43 rods and 3 yards through the centre; how many acres did it contain?
Ans. 9 A. 1 R. 9.28+ sq. p.

61. What is the diameter of a circle whose area is 250 square yards? Ans. 17.84 yd. diameter.

62. A piece of land is in the form of a circle and contains 15 acres; how many rods are there in the circumference? Ans. 173.63+ rods.

63. A semi-circular piece of land contains 1 square mile; how many yards are there in the diameter?
Ans. 2808.55+ yards.

64. Which covers the greater surface, a circle 3 feet in diameter, or a square whose side is 3 feet?
Ans. 1.9314 sq. ft. more in the square.

65. Which contains the greater surface, a circle 25 yards in circumference, or a square whose 4 sides measure 25 yards? Ans. 10.6735 sq. yd. more in the circle.

66. If a circle 23.5 feet in diameter be placed inside of another 50.25 feet in diameter, how many square feet will there be between the two circles?
As. 1549.446 sq. feet.

67. What would be the side of a square having the same amount of surface as a circle 40 feet in diameter?

Ans. 35.449+ feet.

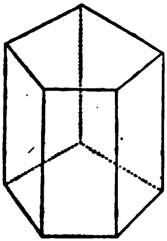
68. What is the diameter of a circle that contains the same amount of surface as a square whose side is 25 feet? Ans. 28.209 feet.

69. How many times larger is a circle 50 feet in diameter, than one 20 feet in diameter?

Ans. $6\frac{1}{4}$ times.

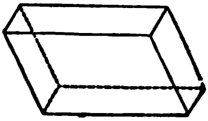
Art. 319. What is a prism?

It is a solid figure whose faces are parallelograms, and its bases, parallel planes, having three or more sides.



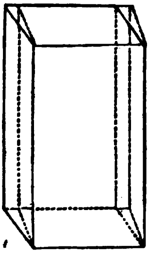
Art. 320. What is a parallelopipedon?

It is a prism whose bases are parallelograms.

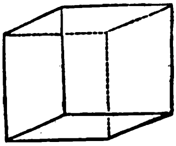


Art. 321. When is a parallelopipedon rectangular?

It is when the faces are rectangles, and consequently, perpendicular to the bases.



Art. 322. What is a cube?



It is solid that has all its faces and bases equal squares.

Art. 323. To find the solidity of a prism,

Rule.—*Multiply the area of its base by its altitude.*

70. What is the solidity of a prism whose base is 25 square feet, and the altitude 12½ feet?
Ans. 312½ cubic feet.

71. What is the solidity of a prism whose base is 4 feet square, and the altitude 15 inches?
Ans. 20 cu. ft.

72. What is the solidity of a rectangular parallelopipedon whose base is a square of which the side is 12 inches, and the altitude 15 inches? Ans. 1¼ cu. ft.

73. What is the solidity of a rectangular parallelopipedon whose base is a rectangle of which the length is 4 feet, the breadth 3.5 feet, and the altitude 23¼ inches?
Ans. 27⅛ cu. ft.

74. How many bushels will a rectangular box hold, which is 20 inches long, 15 inches wide, and 11½ inches deep? Ans. 1.604 bu.

75. A beer vat is 7 feet long, 5 feet wide, and 8 feet deep; how many hogsheads will it hold counting 282 cubic inches to the gallon? Ans. 27 hhd. 14 gal. 3 qt.

76. A bin was made 3 ft. 5 in. wide, 2 ft. 6 in. long, and six ft. high; how many bushels will it hold?
Ans. 41 bu. 0 pk. 6 qt.

77. A man has 4000 bushels of grain; he has ground room 15 feet by 12 ft. 6 in.; how high must he make a bin to contain the grain? Ans. 26 ft. 6½ in.

78. A cistern is 5 feet deep and 6 feet square at the bottom; how many gallons of water does it hold, at 231 cubic inches to the gallon? Ans. $1346\frac{38}{77}$ gal.

79. A cistern is 14 feet deep and 5.5 feet square; if 3 gallons run into it in a minute, how long will it take to fill it? Ans. 17 hr. 36 min.

80. A piece of timber is 22 in. by $15\frac{1}{2}$ on each end, and is 56 feet long; how many tons does it contain? Ans. 1 cd. 4.6 cu. ft.

81. A pile of wood is 110 feet long, 8 feet high, and 4 feet deep; how many loads are there in the pile, counting 2 loads to a cord? Ans. 55 loads.

82. How many bricks, each measuring 80 cubic inches will it take to build a wall 30 feet long, 10 inches thick and 8 feet high? Ans. 4320 bricks.

83. A box is 4.25 feet long, 3 feet wide, and 3.75 feet high; what are the solid contents, and how many square feet of surface does it contain, not counting the top? Ans.

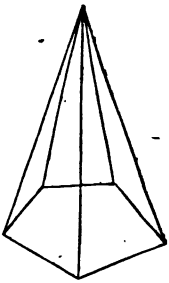
84. If a room be 40 feet long, 25 feet wide, and 15 feet high, how long will be the distance from the rear right hand corner at the floor to the front left hand corner at the ceiling? Ans. 49.5 feet (nearly.)

85. What is the side of a cube that is equal in solidity to a rectangular parallelopipedon whose sides are respectively 6, 12, and 24 feet? Ans. 12 feet.

86. What is the side of a cube whose solidity is the same as that of a rectangular parallelopipedon whose sides are 80, 75, and 60 feet? Ans. 71.13 cu. ft.

87. If the materials that compose the Chinese wall, which is 1500 miles long, 30 feet high, and 20 feet thick, had been put together in form of a cube, how high would it have been? Ans. 1681.2 ft.

88. How many times larger is a cube whose side is 64 feet, than one whose side is 32 feet? Ans. 8 times.



Art. 324. What is a pyramid?

It is a solid having three or more sides at the base, and gradually tapering to a point.

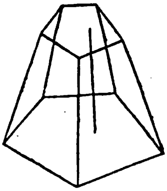
Art. 325. To find the solidity of a pyramid,

Rule.—*Multiply the area of the base by one third of the altitude.*

89. What is the solidity of a pyramid whose base is 5 feet square, and whose altitude is 14 feet?
Ans. $116\frac{2}{3}$ cu. ft.

90. What is the solidity of a pyramid whose altitude is 9 feet and the base a rectangle $5\frac{1}{2}$ ft. by $3\frac{1}{3}$ ft.?
Ans. 55 cu. ft.

91. How many cubic ft. in a stick of timber 30 feet long, 5 ft. 3 in. square at one end, and gradually tapering to a point at the other end? Ans. $275\frac{5}{8}$ cu. ft.



Art. 326. What is the frustrum of a pyramid?

It is that part which is left, after a smaller pyramid is cut off by a plane parallel to the base.

Art. 327. To find the solidity of the frustrum of a pyramid,

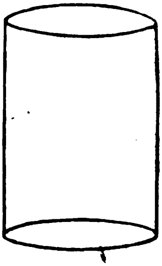
Rule.—*Add together the upper base, the lower base and the mean proportional between the two bases; multiply the sum thus found by one-third of the altitude of the frustrum, and the product will be the solidity.*

92. If the upper base of a frustrum of a pyramid be 40 square yards, and the lower base 90 square yards, while the altitude is 30 yards, what will be the solidity ?
Ans. 1900 cu. yards.

93. What is the solidity of the frustrum of a pyramid whose upper base is 30 square feet, the lower base 53⅓ square feet, and the altitude 27 feet ?
Ans. 1110 cu. feet.

94. How many solid feet in a stick of wood in the form of the frustrum of a pyramid, one end measuring 36 square feet, the other 25 square feet, and the length 125 feet ? Ans. 3791⅔ solid feet.

95. If a stick of timber in the shape of the frustrum of a pyramid, measure 3½ feet square at one end, 2½ feet square at the other and 140 feet long, what will be the solidity ? Ans. 1271⅔ cu. feet.



Art. 328. What is a cylinder ?

It is a solid whose bases are circles, and every section parallel to its bases, is likewise a circle.

Art. 329. To find the solidity of a cylinder,

Rule.—*Multiply the area of the base by the altitude; the product will be the solidity.*

96. A cylinder is 4 feet in diameter and 15 feet high; how many cubic feet does it contain ?
Ans. 188.496 cu. feet.

97. What is the solidity of a cylinder 14 feet in diameter and 27 feet long ? Ans. 4156.3368 cu. feet.

98. What will it cost to have a cistern dug, 7 feet in diameter and 12 feet deep, at 43¾ cents per cubic yard?
Ans. $22.45.

99. What is the difference between a cistern 5 feet deep and 3 feet 5 inches square, and one of the same depth and 3 feet 5 inches in diameter?
Ans. 12.526 cu. feet.

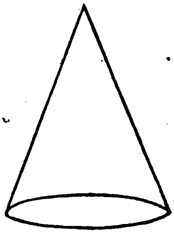
100. What is the diameter of a cistern that is 10 feet deep and contains 400 gallons of water?
Ans. 2 ft. 6.11 in.

101. A cylindrical vessel is 4 feet 6 inches in diameter and 5 feet 4 inches deep; how many bushels will it contain? Ans. 68 bu. 0 pk. 5 qt.

102. How many cubic feet in a stick of timber 33 inches in diameter and 27 feet long?
Ans. 160.3688 cu. feet.

ART. 329. What is a cone?

It is a solid figure with a circle at one end and gradually tapering to a point at the other end.



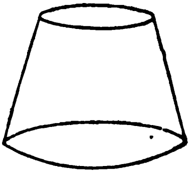
ART. 330. To find the solidity of a cone,

RULE.—*Multiply the area of the base by one-third of the altitude; the product will be the solidity.*

103. What is the solidity of a cone whose base is 12 feet in diameter and altitude 16½ feet?
Ans. 622.0368 cu. feet.

104. What is the solidity of a cone whose altitude is 40 inches and the base 10½ inches in diameter?
Ans. 1154.538 cu. inches.

105. There is a stick of timber in the form of a cone; it is 28 feet long and 20 inches in diameter at one end, and gradually tapering to a point at the other end; what is the solidity of the cone? Ans. 20.36⅞ cu. feet.



Art. 331. What is the frustrum of a cone?

It is that part of a cone which is left after a smaller cone is cut off by a plane parallel to the base.

Art. 332. To find the solidity of the frustrum of a cone,

Rule.—*Add together the upper base, the lower base, and the mean proportional between the two bases; multiply the sum thus found by one-third of the altitude of the frustrum, and the product will be the solidity.*

106. What is the solidity of the frustrum of a cone whose upper base contains 5 square feet, the lower base 7 square feet, and the altitude 21 feet?

Ans. 125.412 cu. ft.

107. What is the solidity of the frustrum of a cone, the diameter of whose upper base is 28 inches, of the lower base 32 inches, and whose altitude is 10 feet?

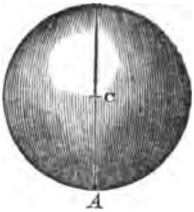
Ans. 49.16 cu. ft.

108. A stick of timber in the form of a conical frustrum is 54 inches in circumference at the top, 64 inches at the bottom, and 9 feet high; what is its solidity?

Ans. 17.354 cu. ft.

109. A caldron in the form of the fustrum of a cone is 4 feet in diameter at the top, 3 feet at the bottom, and 4 feet deep; how many gallons will it hold?

Ans. 289.8433 gal.



Art. 333. What is a sphere?

A sphere or globe is a solid inclosed by a surface, every point of which is equally distant from a point within it, called the centre.

Art. 334. What is the diameter of a sphere?

It is a straight line drawn through the centre and terminated each way by the surface.

Art. 335. What is the radius of a sphere?

It is a straight line drawn from the centre to the surface.

Art. 336. To find the surface of a sphere,

Rule.—*Find the area of a circle whose diameter is of the same length as the diameter of the sphere; 4 times this area will be the area of the surface.*

110. What is the area of the surface of a sphere whose diameter is 48 feet? Ans. 7238.2464 sq. ft.

111. What is the area of the surface of a sphere whose radius is 75 yards? Ans. 70686 sq. yd.

112. What is the area of the surface of a sphere whose diameter is 16⅔ inches? Ans. 6 sq. ft. 8⅔ sq. in.

113. What is the area of the surface of a sphere whose radius is 89.44 rods? Ans. 100524.9 sq. rd.

114. How many square miles on the surface of the earth, counting the diameter 7912 miles?
Ans. 196663355.7504 sq. m.

115. How many square feet on the surface of a globe 40 inches in circumference? Ans. 509.294 sq. in.

116. How many square yards on the surface of a ball whose circumference is 100 feet?
Ans. 3183.1 sq. ft.

117. What is the diameter of a sphere whose surface is 432 square feet? Ans. 11.727 ft.

118. Which contains the greater surface, a cube whose side is 20 feet, or a circle whose diameter is 20 feet? Ans. 1143.36 sq. ft. more in the cube.

Art. 337. To find the solidity of a sphere,

Rule.—*Multiply the surface of the sphere by one third of the radius.*

Art. 338. What is the ratio between two spheres of different dimensions?

They are to each other as the cubes of their radii or diameters.

119. What is the solidity of a sphere 12 inches in diameter? Ans. 904.7808 cu. in.

120. What is the solidity of a globe 18 feet in diameter? Ans. 3053.6352 cu. ft.

121. What is the solidity of a sphere whose radius is 5¼ feet? Ans. 606.13245 cu. ft.

122. What are the solid contents of a ball 4.5 inches in diameter? Ans. 55.21345 cu. in.

123. What is the solidity of a sphere whose circumference is 63 inches? Ans. 7 cu. ft. 1169 cu. in.

124. What is the solidity of a sphere whose surface is 1440 square inches? Ans. 2 cu. ft. 1680 cu. in.

125. How much larger is a sphere 3 feet in diameter, than one 6 feet in diameter? Ans. 8 times as large.

126. How many pounds in an iron ball 7 inches in diameter, supposing a cubic inch to weigh ⅜ of a pound? Ans. 67.34805 lb.

27. How many bushels in a hemispherical bin, 4 feet in diameter, counting the U. S. measure of 2150.4 cubic inches to a bushel? Ans. 13.463+ bu.

128. There is a caldron in the shape of a hemisphere, 5 feet in diameter; how many bushels does it contain counting the New York measure of 2218.192 cubic inches to the bushel? Ans. 25.4+ bu.

129. What is the diameter of a sphere that contains 2000 cubic inches? Ans. 15.63+ in.

130. What is the diameter of a hemisphere that contains 2 cubic feet? Ans. Ans. 23.4+ in.

131. What is the diameter of a hemisphere that contains 100 gallons of wine, counting 231 cubic inches to the gallon? Ans. 44.5 in.

132. How many times larger is a sphere 9 feet in diameter, than one 3 feet in diameter?
Ans. 27 times.

133. If a cannon ball 2½ inches in diameter weigh 3 pounds, how many pounds will one weigh that is 10 inches in diameter? Ans. 192 lb.

MISCELLANEOUS EXAMPLES.

1. How many feet in 17 m. 3 fur. 21 rd. 2½ yd.?
Ans. 92094 feet.

2. Reduce 327 A. 1 R. 19 sq. p. 16½ yd. to square feet. Ans. 14260331¼ sq. feet.

3. Reduce 70 000015½ feet to degrees.
Ans. 190 deg. 52 m. 4 fur. 25 rd. 1 yd.

4. How many pints in 4 hhd. which measure as follows: the 1st, 62 gal. 3 qt. 1½ pt., the 2d, 61 gal. 1 qt. 1⅞ pt., the 3d, 59 gal. 3 qt. 1⅝ pt., and the 4th, 63 gal.?
Ans. 1979 pints.

5. How many hours between the 15th of November, 1851, at 7 P.M., and the 23d of March, 1852, at 5 A.M.? Ans. 3084 hours.

6. The latitude of Constantinople is 41° 0′ 12″; the

latitude of London is 51° 30′ 48″; how many statute miles is London north of Constantinople?

Ans. 730.445 miles.

7. Take 18 T. 16 cwt. 1 qr. 15 lb. 19 times, and divide the result by 5. Ans. 71 T. 10 cwt. 1 qr. 7 lb.

8. How many pounds N. York currency is \$37.87½?

Ans. £15. 3s.

9. How many pounds N. York currency is \$98.68¾?

Ans. £35. 9*s.* 6*d.*

10. Reduce \$1843.78 to pounds N. York currency.

Ans. £737 10*s.* 2.88*d.*

11. Reduce \$587.54 to pounds N. England currency.

Ans. £176 5*s.* 2.88*d.*

12. How many pounds Virginia currency in \$4811.54?

Ans. £1443 9*s.* 2.88*d.*

13. Add $\frac{1}{3}$, $2\frac{1}{4}$, $3\frac{1}{6}$, and 12. Ans. $17\frac{3}{4}$.

14. What is the sum of $\frac{3\frac{1}{2}}{7}+\frac{2\frac{1}{4}}{9}+\frac{1}{3\frac{1}{3}}+5\frac{2\frac{1}{5}}{3\frac{2}{3}}$.

Ans. $6\frac{13}{20}$.

15. What is the difference between $17\frac{1}{4}$ and $3\frac{1}{3}$?

Ans. $13\frac{11}{12}$.

16. From $\frac{2}{3}$ of $\frac{17\frac{1}{2}}{50}$ take $\frac{33\frac{1}{3}}{150}$. Ans. $\frac{1}{90}$.

17. From $3\frac{3}{8}+5\frac{5}{9}$ take $7\frac{4}{7}$. Ans. $1\frac{181}{504}$.

18. To the difference between $\frac{3\frac{3}{4}}{5}$ and $\frac{1}{2\frac{1}{2}}$ add $6\frac{1}{4}$.

Ans. $6\frac{3}{5}$.

19. From the difference between 5 and $\frac{7\frac{1}{7}}{50}$ take $3\frac{6\frac{1}{2}}{7}$

Ans. $\frac{13}{14}$.

20. There was a company of soldiers, of whom $\frac{1}{6}$ was on duty as sentinels, $\frac{1}{5}$ was preparing dinner, and the

rest, 19 men, were drilling; how many were there altogether? Ans. 30 men.

21. The sum of two numbers is 186.005, and the greater one is 93.0961; what is the smaller number? Ans. 92.9089.

22. If the difference of two numbers be 370,15, and the greater one 900, what will be the smaller? Ans. 529.85.

23. The sum of two numbers is 365, and their difference is .0675; what are the numbers?

$$\text{Ans.}\begin{cases}182.53375 \text{ and}\\ 182.46625.\end{cases}$$

24. The sum of two numbers is $\frac{3}{5}$ and their difference is $\frac{3}{8}$; what are the two numbers? Ans. $\frac{39}{80}$ and $\frac{9}{80}$.

25. The product of two numbers is 1000, and one of them is 31.25; what is the other? Ans. 32.

26. The product of two numbers is $3\frac{7}{9}$, and one of them is $\frac{17}{25}$; what is the other? Ans. $5\frac{5}{9}$.

27. If the divisor to a certain number be $33.33\frac{1}{3}$ and the quotient $\frac{11}{50}$, what will be the dividend? Ans. $7\frac{1}{3}$.

28. What is the number, $\frac{5}{6}$ of which is equal to 275? Ans. 330.

29. $\frac{1}{2}+\frac{1}{3}$ of a certain number is equal to $62\frac{1}{2}$; what is that number? Ans. 75.

30. If from $\frac{18}{19}$ of a number there be taken $\frac{1}{2}$, the remainder will be $161\frac{1}{2}$; what is that number? Ans. 361.

31. If A can do a piece of work in 15 days, and B can do the same in 25 days, how long would it take both, if they work together? Ans. $9\frac{3}{8}$ days.

32. A and B can build a stone wall in 14 days; A can do it alone in 21 days; how long would it take B to do it? Ans. 42 days.

33. If a barrel of flour will last one family 18 days, a second family 20 days, and a third 24 days, how long will it last the three families together?

Ans. $6\frac{42}{53}$.

34. If $\frac{7}{8}$ of a number be 60, what is the number?

Ans. $68\frac{4}{7}$.

35. A person bought $\frac{5}{9}$ of a vessel for $32000; what was the price of the whole? Ans. $57600.

36. If $\frac{2}{3}$ of a steamboat be purchased by the captain, and he should sell $\frac{1}{5}$ of his share for $500, what would be the valuation of the whole boat? Ans. $3750.

37. If a person buy $\frac{3}{7}$ of a barrel of flour, and divide it into 6 equal parts, and sell each of these last parts for 45 cents, what would be the value of the barrel of flour?

Ans. $6.30.

38. A merchant bought $\frac{2}{5}$ of a coal mine, and afterward purchased $\frac{1}{8}$ of the mine, both of which cost him $8000; what is the valuation of the whole mine?

Ans. 15238\frac{2}{21}$.

39. A person was going to buy $\frac{7}{12}$ of a vessel, but he changed his mind and bought $\frac{3}{4}$ of what he intended to buy, and paid $4900; what was the value of the whole?

Ans. $11200

40. Abram Miller bought $\frac{8}{9}$ of the ship Cleopatra; he kept $\frac{1}{5}$ of what he bought, and sold the balance for $40000; what was the value of the whole vessel?

Ans. $56250.

41. A stockbroker bought $\frac{2}{3}$ of the capital of a company at par; he sold $\frac{1}{6}$ of his purchase at par and the rest for $25000; by the latter sale he made $5000; what was the value of the whole capital?

Ans. $36000.

42. A capitalist purchased $\frac{4}{5}$ of the capital of a bank at par; he retained $\frac{3}{8}$ of his purchase and sold the bal-

ance for $50000, thereby making 10 per cent. on the cost; what was the total capital of the bank?

Ans. $90909.09.

43. How many yards of carpet that is $\frac{3}{4}$ yd. wide will cover a floor 25 feet by 40? Ans. $148\frac{4}{27}$ yd.

44. How long is a piece of ground that is 100 feet wide and contains 5 acres? Ans. 2178 feet.

45. A surveyor measured a piece of ground in the form of a rectangle, and found one side to be 37 chains, and the other 42 chains 16 links; how many acres did it contain? Ans. 155 A. 3 R. 38 sq. rd. $21\frac{39}{50}$ sq. yd.

46. A farmer owns 425 acres of land which is in the shape of a rectangle, one of the sides is 40 chains 15 links; how long is the other side? Ans. 105 ch. 85 links.

47. How many building lots, each 50 feet by 100, can be made out of $2\frac{1}{2}$ acres of ground? Ans.

48. A, B, and C can build a barn in 10 days; after 4 days A leaves, and B and C go on with the work for 5 days longer, when B leaves, $\frac{3}{10}$ of the work being yet unfinished; C proceeds with the work and finishes it in $11\frac{1}{4}$ days after B left; how long will it take to each build the barn?

$$\text{Ans.} \begin{cases} \text{A in } 25 \text{ days.} \\ \text{B in } 30 \quad \text{"} \\ \text{C in } 37\frac{1}{2} \quad \text{"} \end{cases}$$

49. Divide $600 between two persons, so that one shall have $\frac{7}{8}$ as much as the other.

Ans. $280 and $320.

50. Divide $840 between A, B, and C, so that B shall have $\frac{3}{4}$ of what A gets, and C $\frac{1}{2}$ as much as A and B together.

$$\text{Ans.} \begin{cases} \text{A, \$320.} \\ \text{B, \$240.} \\ \text{C, \$280.} \end{cases}$$

51. How late is it when the time past noon is $\frac{4}{5}$ of the time to midnight? Ans. 20 minutes past 5.

52. Divide \$1560 between two persons, so that as often as one gets \$7, the other shall get \$5?

Ans. \$910 and \$650.

53. Divide \$8145 between three persons, so that as often as one gets \$5, the second will get \$6, and the third \$7.

Ans. { \$2262½ for the 1st.
\$2715 " " 2d.
\$3167½ " " 3d.

54. If two persons are engaged in business where one advances \$550, and the other \$450, and they gain \$500, to how much is each entitled? Ans. \$275 and \$225.

55. A, B, and C, commence business; A puts in \$1250, B, \$3750, and C, \$5000; they gain \$1500; to how much is each person entitled?

Ans. { \$187.50 for A.
\$562.50 for B.
\$750.00 for C.

56. X and Y opened a grocery; X put in \$1000, and Y 12 hhd. of sugar, each weighing 1250 lb., valued at 8 cts. a pound, and 50 barrels of flour, at \$7 a barrel; they lost \$200; what was the loss of each?

Ans.

57. If the tire of a wheel is 10 ft. 3 in. in circumference, and the axle $\frac{7}{22}$ ft. in diameter, how many times faster will the tire move than the axle?

Ans. 10¼ times.

58. Received from Rio Janeiro 300 bags of coffee, each bag 78 lb., tare 5½ per cent., and invoiced at 9 cents a pound; for how much a pound should it be sold to gain 33⅓ per cent., and what would be the total profit?

Ans. { 12 cts. a pound.
\$663.39 total profit.

59. Transferred from Boston to New York 1000 yards of muslin, at 9*d.* a yard New England currency; what is the price a yard, New York currency, and how much Federal money must be sent to Boston to pay for the muslin?

Ans. { 12*d.* New York currency a yard.
\$125 must be sent to Boston.

60. Received from Charleston 150 bales of cotton, each bale 600 pounds, and invoiced at 7*d.* a pound, South Carolina currency. It was sold at an advance of 25 per cent., commission 1 per cent. How much Federal money should be sent to Charleston to pay the owner? Ans. $13921.875.

(61.)

NEW YORK, *Jan.* 1*st*, 1854.

$500.

Sixty days after date, I promise to pay to the order of James Brown five hundred dollars, value received.

JOSEPH THOMPSON.

The above note not being paid at maturity, was protested for non-payment. On the 1st of April the note was paid with interest at 7 per cent. per annum, together with $2 for protest. How much was paid, counting 365 days to the year? Ans. $504.59.

(62.)

Joseph Benson of Charleston, in account with Wilson G. Hunt of New York,

		Dr.
Jan. 1, 1853,	To cash, ...	$1000.00
" 16, "	" 250 yd. of cloth at $5 .	1250.00
Feb. 1, "	" draft.	500.00
		Cr.
March 1st,	By cash	$1500.00
May 1st,	" "	1000.00

What was the balance with interest at 7 per cent. per annum, on the 1st of July, 1853, counting by days, and 365 days to the year?

NOTE.—In this sum find the amount of each purchase and payment, from their dates to July 1st, 1853, and subtract the less sum from the greater, and whichever party has the greater amount, to him will the balance be due.

Ans. $292.09 due W. G. H.

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